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National Association
OF
Cement Users

PROCEEDINGS
OF
FIRST CONVENTION

Indianapolis, Indiana
January 17-19, 1905

PUBLISHED BY THE SOCIETY
CHARLES CARROLL BROWN, SEC.
310 COMMERCIAL CLUB BLDG.
INDIANAPOLIS, INDIANA

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LIST OF OFFICERS AND COMMITTEES FOR 1905.

PRESIDENT—Richard L. Humphrey, 1001 Harrison Bldg., Philadelphia, Pa.
FIRST VICE PRESIDENT—Merrill Watson, 256 Broadway, New York City.
SECOND VICE PRESIDENT—John H. Fellows, Mears Bldg., Scranton, Pa.
THIRD VICE PRESIDENT—H. C. Quinn, Box 529, Dublin, Ga.
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S. B. Newberry. Sandusky, Ohio.
D. N. Harper, Detroit, Mich.
Chas. A. Matcham, Allentown,'Pa.
Arthur N. Pierson, New York City.

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TESTING OF CEMENT AND CEMENT PRODUCTS.

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E. S. Larned, 101 Milk St , Boston, Mass.
J. A. Fairleigh, Louisville, Ky.
Wm. Dickinson, Marquette Bldg., Chicago, Ill.

MACHINERY FOR CEMENT USERS.

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E. B Kelley, 170 Broadway, New York City.
J F. Angell Columbus, Ohio.
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FIRE-PROOFING AND INSURANCE.

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Vice Chairman—E. T. Cairns, 159 La Salle St., Chicago, Ill.
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Chairman—H. C. Henley, Century Building, St. Louis, Mo.
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Jas. G. Houghton, Building Inspector, Minneapolis, Minn.
H. C. Turner, 11 Broadway, New York.

CONSTITUTION AND BY-LAWS

OF THE

National Association of Cement Users

Adopted at the Indianapolis Convention, 1905.

CONSTITUTION.

ARTICLE I.

NAME AND OBJECT.

The objects of this society, which shall be known as "The National Association of Cement Users," shall be to disseminate information and experience upon, and to promote the best methods to be employed in the various uses of cement, by means of conventions, the reading and discussion of papers upon materials of a cement nature and their uses, by social and friendly intercourse at such conventions, the exhibition and study of materials, machinery and methods, and to circulate among its members by means of publications the information thus obtained.

ARTICLE II.

MEMBERSHIP.

Section 1. A candidate for membership must be a company or person engaged in the construction or maintenance of work in which cement is used; a company or person who is qualified by his business relations or practical experience to co-operate in the purposes of this Society, though not himself engaged in the use of cement, and may be a manufacturer of, or dealer in machinery or supplies for cement users; or a man who has attained eminence in the field of engineering, architecture or applied science, who is interested in cement and its uses.

Membership of a company in the Association shall entitle such company to send as many delegates to conventions as it may desire. But one vote can be cast for such membership and the company will in every way be treated as a single member.

Section 2. Each candidate for membership shall make application in writing to the secretary on the prescribed form, stating the name, age, residence, present occupation, and qualifications for membership in the Society. Such application must be accompanied by a fee of Five Dollars ($5.00), which shall include the dues for the current year, and which amount shall be returned to the candidate if his application be rejected.

Upon receipt of an application for membership, the Secretary shall submit a copy of the same to each member of the Executive Board whose duty it shall be to vote upon such application without delay. Nine affirmative votes shall elect an applicant to membership in the Society.

The Secretary shall include in his report to the Society the names and postoffice addresses of all persons elected to membership.

Section 3. Any member who shall be in arrears for more than one year's dues shall be considered as no longer a member of this Society, and his name shall be discontinued from the roll by the Secretary.

Section 4. Any member may withdraw from the Society upon payment of all dues up to date, and by notifying the Secretary thereof in writing.

Section 5. Any member, may for just cause, and after a fair hearing (first by the Executive Board and with their approval by the society.) be expelled from the society by a three-fourths ballot of the members present at any regular meeting, not less than twenty voting. No public announcement shall be made of such action.

ARTICLE III.

OFFICERS.

Section 1. The officers of the society shall consist of the president, four general Vice-Presidents, a Vice-President for each of the sections into which the Association may be divided, as hereinafter provided for in Section 7, Executive Secretary and Treasurer. These officers shall constitute the Executive Board, of which the president and Executive Secretary shall be ex-officio chairman and secretary, respectively.

Section 2. The terms of all officers shall be for one year. The Secretary and Treasurer shall be elected annually by the Executive Board.

All officers except the Secretary and Treasurer shall be elected by ballot of the members on the second day of the annual meeting and shall hold office until their successors are elected and qualify. Officers shall enter upon the duties of their respective positions as soon as the business of the annual meeting at which they were elected is finished. Vacancies occuring during the year, when not otherwise provided for, shall be filled by appointment of the Executive Board. The ballot for any officer may be waived by unanimous consent.

The President shall not be eligible for immediate re-election except by unanimous vote.

Section 3. The duties of these officers shall be those usually pertaining to such offices.

Section 4. Ii shall be the duty of the Executive Secretary to record the proceedings and discussions at the meetings and to edit and publish the publications of the Association. The Executive Secretary shall be custodian of the Association property and shall deliver the same to his successor. He shall keep a record of all donations to the Society with names of the donors and the amounts remitted. forwarding the same to the Treasurer at once, obtaining his receipt for the same, and shall include the same in his annual report to the Association. He shall give bond for the faithful performance of his duties in such a sum as the Executive Board may designate.

Section 5. The Treasurer shall handle the funds of the Association subject to the approval of the Executive Board. and shall give surety company's bond to a designated amount, the said bond to be deposited with the President. The Treasurer of this association shall disburse funds only on warrant drawn by the President and countersigned by the Secretary.

Section 6. It shall be the duty of the Executive Board to audit the accounts of the Treasurer before each annual meeting and to determine, subject to the approval of the Association, the amount of dues for the ensuing year, which amount shall be announced in the annual report at the opening session. The Executive Board shall fix the salary of the Executive Secretary and Treasurer from year to year. They shall pass upon all applications for membership, as hereinbefore provided, and in general shall transact the business of the association under the Constitution and By-Laws. in accordance with such instructions as may be given them by the Association. All proceedings of the Executive Board shall be reported to the association and shall be entered upon its records.

Section 7. The Association shall be divided into the following Sections whose membership shall be determined by the enrollment of members of the Association in such sections as they may choose: Concrete Blocks and Cement Products; Monolithic Concrete; Streets, Sidewalks and Floors; Reinforced Concrete;

Art and Architecture; Cement Manufacture and Testing of Cement and Cement Products; Machinery for Cement Users; Fire Proofing and Insurance; Laws and Ordinances. The Chairmen of these sections shall be elected by the sections at the first section meeting provided on the program of the Annual Convention, and shall be reported to the Association for election as Vice-Presidents of the Association as provided in Sections 1 and 2.

Standing Committies of four additional members each shall be appointed by the respective Chairmen and the President of the Association, to aid the Chairmen in their work. The following standing committees of three members each shall be appointed by the President at or immediately following the annual meeting: Entertainment, Exhibits, Railroads and Transportation.

ARTICLE IV.

MEETINGS.

Section 1. The regular meetings of the Association shall be held in the month of January each year at such time as may be determined upon by the Executive Board, and at such other times as the Association may determine. Each member shall be notified at least twenty days in advance of the meeting. The place of each succeeding annual meeting shall be determined by the majority vote of the members present.

Section 2. Twenty members shall constitute a quorum for the transaction of business.

Section 3. The order of business shall be fixed by the Executive Board.

Section 4. The meetings of this Association shall be governed by "Roberts' Rules of Order."

Section 5. The Executive Board may divide the Association into sections for as many sessions of a convention as it deems desirable and the Chairmen of the Standing Specific Committees shall aid in arranging the programs for these sessions and shall preside at the sectional meetings, the first named in the list of committees having precedence in case two or more committees are included in one section.

ARTICLE V.

AMENDMENTS.

This Constitution may be amended by a two-thirds vote of the members present at any annual meeting, not less than twenty members voting; provided that the substance of the proposed amendment be presented in writing to the President and Secretary in time for incorporation in the official call for the meeting.

BY-LAWS.

No. 1. Members shall not be permitted to give out for publication any papers, to be submitted to the Society at its annual meeting, in advance of such meeting: and all request for papers for such purposes shall be referred to the Secretary.

No. 2. All committees and members of the Society shall be required to furnish one copy to the president and one copy to the Secretary of all reports, papers or other matters submitted to the Society for its consideration, at least two days in advance of the annual meeting, for their approval.

No. 3. It shall be be the duty of the President, on or before the first day of February of each year, to divide America by States into Territorial Sections, and to assign one or more members of the Executive Committee to each of said sections. It shall be the duty of the members of the Executive Committee thus assigned to aid in extending the knowledge of the Society in their districts and in securing new members and in retaining old members. Plans for improvement and promotion of the interests of the Society are expected of them.

No. 4. The Secretary shall be required at least sixty days before the holding of the annual convention, to communicate with the local committee having charge of the arrangements for the convention in the city in which the same is to held. with a view of securing exact data as to place of meeting, entertainment to be furnished, hotel and railroad rates, etc., and to print the information together with such data relating to the business of the above convention as he may have, and distribute it.

PAPERS PRESENTED
AT THE
INDIANAPOLIS CONVENTION
OF THE
National Association of Cement Users.

January 17-19, 1905.

COLORING OF CONCRETE.

BY J. P. SHERER, MILWAUKEE, WIS.

Representing the pioneer block manufacturing company of the Northwest, we have made many experiments in coloring artificial stone.

First, I will state to you that we found that ground colored natural stone and mineral iron oxide were the most desirable and practical from the fact that they in no way weaken or damage the setting qualities of our stone, but, on the contrary, they add very materially to the strength of the finished product. We tested many different coloring compounds with fair results, but all those containing acids or greases (among those are graphites and lampblacks) are found to be detrimental.

We tested some very fine samples of ground crushed stone from Europe and from different sections of the United States, always with the same result. They are too weak in actual coloring matter to bring about the desired shades, and always with the same complaint, too expensive; expensive, at least, in the manner we always use coloring, as we color our entire stone.

Very early in our manufacturing experience we dropped the facing plan and adopted the plan of coloring the entire stone. Beginners are led to believe, as we were, that the facing of stone is desirable. In theory it is all right; in practice we found it undesirable, and were not satisfied with the results financially. That many beautiful results may be obtained is true, both in the facing and coloring of stone, but that the facing of blocks is not practical, and that they are not merchantable on account of the cost of manufacture, is also a fact, and we have found that the best results are obtained by keeping as close to the manufacture of your primary product as possible. We may at times find customers that will pay the additional price, but they are the exception and not the rule.

To illustrate this, we will mention that we were recently asked to figure on a very elaborate design of an office building for one of our large manufacturing concerns, but when we made our estimate and named the price, the owners simply shook their heads. That one of our competitors made this building is a fact, and that it is a handsome building is true. However, the contractor recently asked me to condole with him on the results financially. The only satisfaction I could give him was the old reply, "I told you so."

In making tests either with coloring concrete blocks, or concrete of any character, it is our motive to make our product at a minimum cost, and market at a fair profit in competition with other non-combustible materials.

The colored stone that we are most frequently called upon to imitate in Wisconsin, is what is known as, "Portage Entry Red Stone." This is a Northern Michigan product, and we are at a loss to know why they term it "red" stone, for, in fact, it is a very light shade of pink and the most singular condition is that if we were to produce an artificial stone as light in color, the public would exclaim at once, "Why, how pale it is. It must have faded considerably." Our only test is to place the natural product by the side of the manufactured, and allow our customers to see the difference. Then they say: "I did not imagine it was so light."

We have found it necessary to color our artificial stone several shades darker (when first made) than the natural product. We are frequently asked, "Will not this color fade?" That the stone grows lighter as the cement sets is true, and it will continue to grow lighter until it has attained a thorough initial set and has became dry. This setting and drying process (as all of you well know) is governed largely by the temperature and time of the year and the exposure to which the manufactured product is subject. All of you who are contractors and builders, know that when you desire a deeper or darker shade of mortar coloring, you are obliged to make your wet mixture many shades darker than when it is finished and the action of the lime has taken place.

We are also frequently asked what proportion of coloring matter we use per stone. This is rather hard to answer from the fact that different block manufacturers make many different sizes of stone and that the material used in different localities varies so much in character. We also find that different cements change the coloring more or less. However this not perceptible to any great degree.

In the manufacture of red stone with such sand and cement as we are in the habit of using, to obtain a strong, deep, cherry red after final setting, we find it necessary to use from 5 to 7 pounds of the pure mineral oxide per cubic foot of concrete. In this mixture we use clean silica sand containing no loam or clay of any character and very little organic matter. We also found that the thorough mixing of the color with the cement before adding sand was very necessary.

We discovered that to get good results it was absolutely imperative to have our sand thoroughly dry and that we were obliged to mix sand, cement and color together thoroughly, much more so than in making the ordinary concrete block. We learned this early in our contracting career, when at times we found it necessary to use lamp black in producing dark mortar color. We were at a loss many times to find some liquid mixture with which the lamp black would thoroughly assimilate. At times we used vinegar, at others stale beer. By simply taking very fine dry sand and mixing the lamp black with it thoroughly we found no trouble in getting an even, dark color for our mortar.

We have been for some time endeavoring to get a green stone for an architect and customer, but as yet we have not been satisfied with the results. We did make a green stone, the body of the block being of a moss or olive shade, with streaks of livelier green color running through, but we have been somewhat afraid to recommend this stone to the architect as we have not fully satisfied ourselves as to the action of this ultra-green on the cement. Our first trial was some six months ago, and we are watching the product of this trial very carefully. As yet it shows no signs of disintegration, and we are now subjecting it to the strong climatic changes, to see what effect the weather will have upon it.

We also found that to get an even artistic product, it is essential to have our materials as nearly in the same condition as possible, as regards moisture and mixing, all these little details causing additional expense over the original product we made.

We are frequently asked, "Have you experimented with hydrated lime, stucco, or other fine minerals, in making colored concrete?" Yes, we have experimented with all of those, and, in addition, have used other fine filling materials, such as Warrenite ground flint clay, also ground silica. I found that hydrated lime and gypsum quickened the setting qualities of the material, provided enough water was used and added from time to time, to keep the concrete from burning or falling apart, as the lime or stucco absorbs the moisture more rapidly than the cement, and robs it of the moisture it must have. I also found that if I succeeded in keeping it moist enough, after a period of six months or a year a condition almost akin to decomposition set in, and the mass would crumble and fall apart. However, the latter conditions did not occur with the ground Warrenite or fine silica, but we did find that it was necessary to add about two more parts cement to get desired results with the extremely fine material.

You ask: "Why use such fine material?" We found that in producing a beautiful colored article of artificial stone, it was necessary to have a very dense product, especially when your customer gives the stone a close critical inspection.

We also found that we had to contend with a common enemy, that of efflorescence, or a white exudation that many times appears on concrete. We think the colored stone is more trouble than the ordinary stone, on account of its delicate and finer face, and consequently it shows more readily than on the natural stone. It has been our experience, and it is also the consensus of opinion of those who have given this matter study, that this condition is largely governed by the amount of moisture given to the product, both when it is originally mixed and later, when passing through the process of curing. We hope by continued study and observation to be able to determine the exact amount of water to use in order to prevent this trouble.

We have also observed that the temperature had considerable to do with the forming of this coating on the exterior of the stone. We notice in ordinary brick-work and in natural stone, in walls where there is an excess of water deposited, this exudation passes through the wall more easily in freezing and thawing weather. While it may not appear to any extent on drier portions, it will accumulate in moist places and form a considerable coating on the surface. However, we find by applying at intervals a solution of potash and dissolved alum, we can almost eradicate this difficulty, and with each succeeding year it grows less and less, until it finally fails to appear at all. This is accounted for by the free lime becoming exhausted, and for this reason we advise and use as limited amount of mortar as possible in laying blocks in place, and protest against the filling of any of the natural air spaces with mortar or any foreign material.

Inquiry has been made as to what effect fire or extreme heat has on colored or faced stone. That the colored stone makes an excellent showing in a fire test is true, but that the colored faced stone does not fare so well is on account of the difference in the expansion and contraction of the two bodies of concrete, causing the denser body to separate from the coarser or more porous material.

Our test of stone under hydraulic pressure shows more defects when faced, the facing spalling off. This is the case, especially when any great amount is used, by the way of illustration, from 1-8 to 3-8 or 1-2 inch in thickness. When but a light dusting of facing is applied to the coarser material, this separating under fire or pressure test is not very great.

As to the relative strength of colored stone, we will say that all tests as made by us have shown to the advantage of the colored product, especially when colored with pure oxide of iron or pure manganese, the former for red stone, the latter for brown stone. Our tests show, however, that our gain was more tensile than crushing strength, as it appears to give the product more fiber.

In explanation of our tests I will say that they are all of a primitive rather than technical character, except, perhaps, that of the crushing under hydraulic pressure. All of these tests were on blocks made of what we term finer grades of material, as we use this character of material to obtain a more artistic rock faced stone. We also observe with these tests that blocks containing coloring matter, especially oxide and manganese, invariably show from 8 to 10 per cent more resistance than any uncolored stone. However the additional tests made at six months, do not show as large a percentage of gain.

TESTING OF CEMENT BLOCKS.

BY PROF. JOHN R. ALLEN,
UNIVERSITY OF MICHIGAN, ANN ARBOR.

With the increasng use of cement as a building material there should be devised some standard method of testing the various cement products. As long as cement was in use for sustaining loads which produced only compression in the material, the testing of finished cement product was of less importance. Recently, however, cement, especially in the form of reinforced concrete, has been used where it is subject to strains in tension as well as in compression. The strength of cement in tension being only from one-fourth to one-sixth of its strength in compression, it is very important that we know what the tensile strength of the cement product is.

Ordinarily the strength of cement only is determined and this is done by testing the strength in tension of a neat briquette. This briquette is usually carefully made in a cement testing laboratory. These tests, however, are only useful in so far as they give the strength of the cement. Take, for example, concrete. The strength of the concrete does not depend alone upon the strength of the cement, although this is probably the most important item. The broken stone, gravel and sand that are mixed with the cement play a very important part in the strength of the finished product. This is particularly noticeable in concrete which has been made from gravel. If the gravel contains earthy matter it very materially lessens the strength of the concrete, even though the cement used may be of the very best quality.

The use of sand which is not sharp enough or which contains some earthy matter reduces very perceptibly the strength of the concrete. In order, then, to get really reliable results in testing, concrete blocks of he finished materials should be tested. These blocks should be taken if possible from the regular factory stock and not made especially for test purposes. The method which the writer has used in testing cement blocks is as follows:

The block is placed on the platen of an ordinary testing machine and supported on knife edges 20 inches or more apart if the length of the block will allow. The load is then applied at the center of the block equally distant from the supporting knife edges. This subjects the block to a cross-breaking strain, the upper side of the block being in compression and the lower side in tension. Concrete, having much lower strength in tension than in compression, the block gives way first on the lower or tension side. The results obtained from tests of this kind give a comparative value of the tensile strength of the materials used. After the block has been broken a piece is cut from some uninjured portion of the block and tested in compression. If possible, this compression piece should be at least 3 inches square and not over 8 inches long. Knowing the strength of the concrete in compression and the moment of the cross-breaking load, the approximate tensile strength of the concrete may be computed. The following table contains the results obtained from a number of concrete blocks. The blocks tested are different forms of building blocks:

No of Block	Distance between supports	Area in compression	Strength in cross breaking	Strength in compression	Comp. strength per sq. in.	Tensile strength per sq. in.
1	13	12	5450	7250	604	....
2	24	13.1	3000	15000	1060	....
3	21	12	4100	8450	705	121.8
4	21	15.2	4000	22850	1500	300
5	21	16	2900	15100	940	237
6	21	11	3600	14550	1320	235.5

No results are given for tension in Blocks Nos. 1 and 2, as it was necessary to test these blocks on the side, putting them in a position in which it is very difficult to measure the tensile strength accurately. Block No. 1 showed very low tensile strength owing to a lack of uniformity of the material of which the block was composed. Block No. 2, which was made of the same material, showed much better results. Block No. 3, also showed low results. In the case of both Blocks No. 1 and No. 3 the material composing them was very fine and their low tensile strength is probably due to there being an excess of sand and the stone used being too small. In addition it is quite probable that these blocks contain some earthy matter as the fracture of the block seemed to indicate. All of the blocks in the table above were made from first-class cements. Blocks No. 3, 4, 5 and 6 were mixed—one part of cement, two of sand and three of broken stone—and were all at least four months old. These blocks showed quite widely different results, considering the fact that they were supposed to have been made from the same material. The difference is undoubtedly due to the improper mixing of the materials which composed the block, and also to the use of sand and gravel which contained a small admixture of earthy matter.

The points which I have endeavored to bring out in this very brief paper are two. First, In a great many cases the manufacturer does not give sufficient attention to the materials used in forming the concrete. In most cases more attention is given to the strength of the cement. This of course is very necessary, but as much care should be given to the securing of suitable sand and broken stone. If gravel is used in place of broken stone it should be selected with great care, as gravel concrete is much more apt to be uncertain than concrete made from broken stone.

Second. More attention should be paid to the testing of the finished product; that is, the testing of full-sized concrete blocks.

The testing of sample briquettes is quite necessary and desirable, but it does not always indicate the strength of the finished product when made up in final form. In inspecting concrete work it seems to me highly desirable that samples of the concrete as mixed should be taken directly from the mixing board, formed into suitable-sized rectangular blocks and tested in cross-breaking and in compression. These blocks would then show exactly the strength of the material used in construction.

It would seem to me highly desirable that a committee be appointed from the various associations interested in the manufacture and use of cement to consider the best methods of testing both cement and concrete and this committee should make its recommendations to the associations for their adoption so that standard methods can be employed for the testing of concrete materials.

THE DRY MIXTURE OF CONCRETE.

BY A. L. GOETZMANN, CHICAGO, ILL.

The subject of my paper is the "Mixture of Concrete," a broad subject and one upon which much has been said and written. There is a strong difference in the treatment not only of the mixture but subsequent manipulation as between the so called wet or "slop" mixture of ordinary concrete construction and the dry mixture used in the manufacture of cement blocks, a phase of the subject little considered by writers, but of primal importance to those who are engaged in that pursuit.

I have therefore taken the liberty of departing from my text to the extent of considering wholly the "dry" mixture and the manufacture of concrete or cement blocks under this method, in the belief that from a discussion of this subject may be evolved a method of procedure for the block manufacturer, which may be made of value to the recruit entering the ranks who is now practically without literature and left almost wholly to his own devices.

In this paper I have endeavored to outline methods for cement testing, mixing, and general block manufacture which shall I hope be of advantage to the small manufacturer, to the man who has not the facilities for elaborate testing, whose business will not permit the employing of expert cement men but whose failures may militate against our product to the same extent as if he operated in some of our larger cities, and on a large scale.

In this effort I have asked for and received the opinions of some of the foremost block and machinery manufacturers of the country, as to a few of the more important points connected with block making. I shall advance my own individual ideas upon points when block men are at variance; and as far as possible hope to bring out sufficient discussion along these lines that the ultimate results may be to the benefit of the average block manufacturer.

The first important consideration in the making of a block is the securing of a cement which best answers the purpose of such construction. Needless to say,—no natural cement will answer the purpose. Authorities condemn puzzolan cement, so that the matter simmers down to that of Portland cement alone, as being satisfactory. In the selection of a Portland cement for block manufacture the question of price should not be considered. That Portland cement which by testing gives the best results should be purchased, regardless (at least within due limits) of price. By this I do not mean an imported cement. We are making today in this country cements which are fully as good as the best imported.

It is not possible under ordinary conditions for the average block manufacturer to make tests on his cement that will give results satisfactory to him or acceptable to the cement mills who have furnished the cement.

The block manufacturer, however, who is financially able and has a plant sufficiently large to warrant the expense should by all means test every consignment.

The average small manufacturer will safeguard himself best by making purchases from old established mills of recognized standing, and make no experiments after he has found a satisfactory brand. He should specify in his orders that he desires a seasoned cement and secure from the mills the test reports covering such consignments. All cements are tested at the mills and these reports may always be secured upon request.

A "seasoned" cement should be specified since all cements when properly stored grow better with age. Fine unpulverized nodules of cement disintegrate with age and upon the fineness, to a great extent, depend the hydraulic properties. Such nodules are inert until disintegrated, acting about the same as sand in the mixture, and this seasoning should rather be done at the mill where proper facilities are afforded than in the storehouse of the average block plant.

In cement testing great care should be exercised to secure accurate, trustworthy results. Cleanliness, accuracy, good apparatus combined with a technical knowledge of cement are necessary to produce such results.

For each testing laboratory I should recommend that the rereports on standard specifications for cements put out by the American Society of Civil Engineers be secured and followed as to methods and the acceptance or rejection of cement be based on such specifications.

The specifications above mentioned are I believe, the best literature bearing upon the subject. They are the result of considerable study and research on the part of some of our leading engineers and chemists but most important to the purchaser. No mill will go back of tests and results based on them

I should recommend that all tests be made of proportions of sand and cement as used in block manufacture instead of testing neat cement.

The American Society of Civil Engineers standard specifications call for an initial set of not less than 30 minutes. This is a feature which should be closely watched by the manufacturer. It is recommended that a batch, larger than may be used up within this time, be not made. It is possible for slower setting cement to be secured but, unless specified, mills will I believe conform as nearly as may be to these specifications and after crystallization once sets up, the strength of the cement is greatly reduced by breaking down and retempering. When necessity for slower work exists do not fail in ordering to specify a slow setting cement. Secure from the mill the rate of setting and govern the work accordingly.

Exercise close supervision over the storage of the cement. Store only in water-tight buildings raised from the ground, preferably with room for circulation of air underneath. Use no cement which has once hardened, remembering at all times that your profit and loss account is more nearly bound up in your cement than almost any other phase of your business.

Sand.—Opinions vary considerably as to sand, running from fine to very coarse, but all agree on the one point that it should be sharp and clean. It is my own individual opinion that the question of size of the sand makes comparatively little difference, so long as it is clean, sharp and enough cement be used to properly fill the voids. I have seen blocks which tested good strength by crushing, which are made of a mixture of crushed granite which was passed through a screen of forty to the inch, and also an equally good block made from the very coarsest torpedo sand.

The main consideration, as I have stated, should be that the sand be free from clay, iron rust, vegetable matter or other impurities and as nearly as possible pure silica. The best sands are those which have been washed to remove these impurities. Care should be exercised in bank sand that there be no nodules, iron rust pockets or rotten stone in the bank. It is recommended oftentimes that two or three differeent sizes of sand are an advantage and I quite agree with this, provided the different sizes are screened and the mixture be made of known proportions.

Aggregates.—There seems to be a uniform opinion among machine men that larger material than sand is advantageous, and there is no doubt that where there is enough sand and cement used to fully fill the voids that it makes a cheaper block. As to whether it adds to the strength depends entirely upon the material of which it is made. Such aggregates may vary from size to pass a one-half inch ring to that which will pass a one and one-half inch ring.

An important feature often neglected in making blocks with an aggregate is that of cleanliness. All such material should be thoroughly washed before incorporating into the concrete. A material with dust or clay on it will effectually resist the adhesion of cement.

Hard crushed limestone, gravel, crushed granite, quartz or trap rock are recommended. Soft limestone is bad on account of its being so great an absorbent of the water and all limestones are placed under the ban by some on account of the danger of disintegrating in fire.

Mixing.—Upon a proper and thorough mixing of the cement and sand or cement, sand and aggregates depends the quality of the finished product. The best of cement and pure silica sand, poorly mixed, will produce a poor block. There are a number of first class power mixers on the market, and machine mixing is always preferred to hand work, as it produces a uniform thorough mix, as the hand work will not. Where hand work is necessary, spread the aggregates over the body of the mixing board at a uniform depth, spread the sand evenly over this and the cement over the sand, and, with shovels or hoes, turn each over and back at least three times dry, smooth the mixture over with a shovel or hoe and see that the mix is of uniform color. Sprinkle and turn again, sprinkling as it is being turned three times, test for streaky appearances again. Turn until streaks entirely disappear.

As to the proportion which should be used, this is entirely dependent upon the sizes of the sand and aggregates and can only be told by testing.

Most block manufacturers recommend a given proportion as 1 to 5, 1 to 4, etc., with no knowledge of sizes of material to be used. This is not a safe proposition. An excess of cement is waste and failure will result from a deficiency and neither can be told until one has a knowledge of materials to be used.

A perfect block is that wherein all the voids are filled and every particle of sand and aggregate is covered with cement.

To secure knowledge as to what is necessary to produce this block, thoroughly dry and screen your aggregates into two sizes. Taken a given volume, say two cubic feet of the coarser, mix with this all of the finer which it will take without increasing the volume, mix with this all the sand which it will take without increasing the volume. Add water until it rises to the top of mixture, measure and add, by volume, cement of the volume which the water shows. Where torpedo sand (which runs from the size of a pea down and from whch fine sand has been washed) may be obtained, a mixture of the coarser aggregates with the torpedo sand saves the necessity of extra screening and gives same results.

A series of experiments demonstrates that a mixture made with torpedo sand and aggregates ranging from one-half inch to one one-half inch requires proportions of 1, 2½ and 4. Tests with the coarser and finer materials show 1 of cement, 2 of sand, 2 of fine and 4½ of coarser materials, and where a medium sand is the only available material a proportion of 1 to 4 has proven necessary.

Of such a mixture may be made a block every void of which is filled. Sufficient cement is used so that every particle is covered and so that voids between the granules of sand are filled with cement, making a firm bond between such granules and between the aggregates. Your block is dense, offers strong resistance to the passage of moisture, is fire proof and will stand a crushing strain equal to the very best hard limestones.

For a block composed entirely of sand and cement I should recommend a mixture of two sizes of sand, a coarse and a fine, testing the proportions required exactly as with aggregates. Do not, however, let the matter rest with such tests. In practically every block plant the sizes of sand and aggregates used are constant. These tests are to be used as a starter. Make up your blocks of proportions these tests indicate. After thoroughly cured and dried, break them, note their structure, density, etc. A good block in breaking should break across the stone of the aggregate instead of pulling it from its bed. If possible subject your experimental blocks to test at some good testing laboratory and vary your proportions as such tests teach you. In this, as in every other phase of the block-making industry, never admit yourself as knowing all about it or as being perfect. The mixtures above given will not give the fine texture of face required in many instances and facing of finer material is necessary. For this finer material crushed granite, marble, glass or fine, clean silicious sand or crushed silica may be used, the degree of fine depending upon the consistency desired. Such mixtures in proportion of 1 to 3 give good strength and are sufficiently dense.

It is sometimes recommended for securing a whiter face and a more nearly waterproof one, that a percentage of lime be used. This is a dangerous practice since the deterioration in strength by the admixture of lime is very rapid and results in the hands of the average workman are at least problematical.

The amount of water necessary for the "dry" mixture most used depends upon the materials, the test most often applied being to press some of it in the hand. It should stick together and leave only a small amount of moisture in the palm. The mixture should be just wet enough to cling together after tamping and not enough to stick to the face of the mold. A short experience teaches one so that the appearance of the mixture will tell when sufficiently wet.

Curing.—The curing of a block is to my mind one of the most important processes in the block manufacture. We may take a block made of the best Portland cement, clean sharp sand, and a satisfactory aggregate, well mixed and thoroughly tamped and spoil it by not properly curing.

The primal requisite in proper curing is water, and plenty of it. The sprinkling of a block two or three times a day is not sufficient. In my opinion, the cement block of a few years hence will be cured entirely under water. The best value of cement is only secured by the admixture of water in quantities as the cement needs it. A block should cure uniformly throughout. The inside is wet continually, with the outside wet but periodically. With the fourteen hours of night intervening between sprinkling it is reasonable to suppose that the crystallization will not take place uniformly, internal stresses will set up and the best strength of the block is lost. Cover the finished block after the first twenty-four hours with hay, straw, burlap, sand or any material which will hold moisture. Thoroughly soak the enveloping material with water and keep it so for at least six days.

If this method is not feasible, put on a spray which will run continually. Let them have all the water they will take up and let them have it when they want it. Cure six to eight days and dry at least ten before placing in the wall. Do the curing out of the sun and wind.

A series of questions of general interest propounded to twenty-cement block and machinery manufacturers brought forth the following replies:

What are your preferences for block manufacture? Eight expressed preference for sand and cement; six for sand, crushed stone and cement; six for sand, gravel and cement.

What size sand? Coarse, eight; fine, twelve.

Do you recommend crushed limestone for blocks? Yes, five; no, twelve; yes, if hard, three; nine of objectors did so on account of fireproofing considerations.

When sand and cement alone are used what proportions? Five to one, three; four to one, twelve; three to one, five.

When larger material, what proportions? One-to-two, three; one-two-four, seven; one-two-five, seven; one-three-six, one; one-two-three, two.

What length of time do you recommend for curing blocks? Varied from six days to two weeks. Majority about seven days.

Have you ever used finely crushed marble, granite or quartz for block manufacture? Yes, 6; no, 8; no answer, 6.

If crushing tests have been made, state results. No answer, 9; no tests, 6; a little less than fine sand, 2; good, 3.

What is your opinion of block so made? No. answer, 9; good if properly made, 6; sacrifices strength to beauty, 1; poor, 4.

Summing up these expressions the preponderance of opinion is as follows:

Sand and cement mixture for manufacture. A fine sand preferred to the coarse, proportion of one part cement to four of sand, opposed to crushed limestone as aggregate. Where aggregates are used, proportions of 1 to 2 to 4 and 1 to 3 to 5 equally favored. Blocks to be cured by sprinkling at least seven days. Generally opposed to use of fine crushed material for blocks—but experience limited.

The cement block industry has reached that point in its development wherein a meeting such as this and the formation of an association such as this promises to be, are essential.

The business is on its feet, the plant is well started, product selling. It is time to stop and ask ourselves a few questions. Are we doing the best we can? Are we turning out the block we are telling our customers we are? Are we doing all we should for the confidence the building public are placing in us? In other words, don't we need a little more education? Would it not be a good plan for me and my competitors to get together and work up a plan of advertising to acquaint the public, the architect and the engineer with the cement block instead of each endeavoring to convince him that his individual block is the best and only one.

Is not the time here, gentlemen, when we should recognize the common ground upon which we stand? A time which calls for us to get together for the interests of all—education, insurance rates, publicity, laws, etc., etc.

Other interests recognizing the hand-writing on the wall are assailing us. I read but a few days since an article in a magazine devoted to hollow tile and named "Fireproofing," wherein was an article showing a cement block failure in a little town in Oklahoma. I have endeavored to substantiate the story, but without success. The principle of the illustration, however, is here. The blocks may have been poor, they may have been made of a proportion allowing so little cement that they would absorb their own weight in water. The article was given great prominence and (from the standpoint of the hollow tile man) deservedly so. The point of the illustration is that the one who most strongly recognizes the competition and is most affected is presenting a solid front against the concrete block.

Our duty is to educate the block maker wherever he operates and whatever block he manufactures, so that failure shall not occur. Educate the public to the value of the cement block. Place our product on a plane to meet the approval of the architects and builders, and give publicity to our fire and other tests.

Devise such ordinances for our cities and towns as will compel the making of a good block and behind which the architect may stand and such as will show the advantages over other products.

A cement block twelve inches thick is stronger than an eighteen-inch rubble stone wall, yet in most of our cities we stand on the old ordinances and put in our blocks on that basis.

A well made cement block with 30 per cent voids is stronger than a rubble stone wall of the same thickness, yet the alderman presents an ordinance calling for not exceeding 15 per cent voids, and we let him do it. Why? Because we have not gotten together, secured expert tests and forced him to take a proper position.

The old illustration of the man's sons and his bundle of rods was never better illustrated than in this industry.

Let the slogan of the National Association of Cement Users be education for self, for the public, a perfect block.

PRACTICAL WORK OF CONSTRUCTING SIDEWALKS.

BY A. T. GRIDLEY, CITY ENGINEER, AURORA, IND.

The specifications uniformly given by myself for cement sidewalk paving are: First, excavate to a uniform depth of eleven inches below the finish grade; second, fill with stone-coal cinders (not ashes) seven inches when well rammed to place; when the concrete is ready dampen the cinders to prevent absorption of water from the concrete. Third, on the top of the rammed cinders fill three inches deep with cement concrete prepared as hereinafter described, when thoroughly rammed to place. Fourth, then finish with one inch of fine cement mortar as hereinafter described. The fine cement mortar is made (all parts by bulk) of one part of Portland cement to two parts of clean, sharp sand, mixed dry in a water-tight box. The concrete is made of five parts of durable stone crushed to a three-quarter-inch mesh and thoroughly screened to one part of the aforesaid fine cement mortar. In mixing the concrete first place the stone on a large water-tight platform, then wet thoroughly, then apply the fine cement mortar (dry as yet) and mix until every particle of the stone is coated with the fine cement mortar, and apply to the work at once, thoroughly ramming to place. While the concrete is being rammed to place sufficient of the fine cement mortar, should be wet enough to move freely under the trowel, immediately applied to the work, thoroughly troweled down against the concrete, rodded off with a straight edge held so as to compress the mortar and rough-finished with a plasterer's trowel. The work will then be left for the finisher, who will first float the work to a uniform surface and then give it a good polish with the trowel. Gravel with no pebble larger than three-quarters of an inch may be substituted for the crushed stone before named, and where the gravel has sufficient sand of good quality mixed with it, naturally the concrete mav be made by mixing the Portland cement, one part to eight, directly with such fine gravel, first dry and then immediately applied to the work.

Very simple in the telling and quite true, but it doesn't necessarily secure good work, hence we need to consider some of the requisites that cannot be entered up in the written specifications. The first is a council that will stand by the engineer in his efforts to secure good work. The people pay for good work and the Council should see that they get it. The next requisite is a city engineer with a backbone, one sufficiently stiff to discharge an unfaithful workman instanter, and to compel the contractor to realize the very important fact (to him) that good Portland cement work is of less monetary cost than poor work. Very few contractors are practical cement workers; are not in the business for their health, but to make money; and are slow to realize that in this particular case (regardless of other cases) good work has a first cost less than poor work. We will consider some other like requisites further along.

The selection of the materials should be left entirely to the engineer. As to the Portland cement, one can only say that they are all like the toper's whiskey, "good." I have found no such difference as is claimed by the various makers and by many cement users. Different brands work differently, but good results can be had from any. I have found it best to give the workmen that brand with which they best like to work. As to stone or gravel, I can say only that it must be durable. Many kinds of stone air-slake and dissolve out of the work. To say clean, sharp sand is sufficient, but some may not know just what is meant by sharp. It means a sand that shows acute angles under the microscope and so hard that when rubbed between the thumb and fingers none crumbles and no dust forms. It should give a good, sharp, clear ring when handled with a shovel. But let me give you my test. Mix your cement and sand in such proportions as to bring out a plainly discernible slate-green color. If you cannot develop that color, get some sand with which it can be done. With that you are assured of good work, without it you are not. It is the opinion of your writer that more defective work is due to a poor quality of sand than to all other causes combined. Too much insistence can not be made that all the materials must be clean. The entire virtue of cement is in its adhesiveness. If the materials are not clean the adhesion will not take place. This particular applies to the water as well as to the other materials.

Some critic may here say that he has had good work from sand which showed considerable color on the hand and that made the water yellow when thrown into it. Quite true, and quite untrue. The result is apparently, in many instances, better work. But it is only in appearance. The clay which makes this color is not calcined and sooner or later dissolves out of the work with corresponding loss of strength. Many years ago masons and plasterers learned that with a clean, sharp sand and well-burned lime as good results were not had with clean water as with water to which some yellow clay was added and well stirred in before mixing with the lime and sand. It was this very mixture which led to the discovery or invention of Portland cement. These same old-time masons knew that the clay would dissolve out of the work where the work was exposed to the rains. To obviate the difficulty they took the same old Thames mud and burned lime and mixed them, burned them again together, ground them and used them as they had the lime. The work thus produced so much resembled the natural Portland stone that this mixture was called, in turn, Portland cement. The name yet holds good, and the principle yet remains that you cannot make durable work out of unburned clay.

The substructure of the sidewalk may be of the natural surface, crushed stone, gravel or cinders. The essential point is to secure certain drainage. If that cannot be had in any other way, drain tile must be used. Your writer prefers cinders because they part with the water more readily than do other materials and with them there is no tendency to the formation of frost-nails, which are the prime cause of cracking of the work. Just here I want to enter a protest against the use of deep-tongued tools in finishing between the blocks. The usual specifications for dividing the work into blocks are: Divide the concrete into blocks of not more than twenty-five square feet area with a sand joint not more than one-half inch wide. Also divide the finish coat into like blocks with the joints exactly over the sand joints in the concrete with a trowel cut only and finish with a marking tool having a tongue not more than one-fourth inch deep nor more than one-sixteenth inch thick, and joined to the plate with a radius of not more than one-eighth inch. Yet I frequently find men using a marker having a tongue an inch deep and a quarter of an inch thick. The theory for this is that the deep cutting prevents cracking beyond the cut. It doesn't; hence the theory is incorrect. The trowel cut makes a permanent division in the top coat. The shallow marker presses the edges close together, but they do not unite, and so prevents the entrance of water into the joint; hence there is no expansion to push the blocks apart. Great care should be had that none of the dry sand used in making the sand joint in the concrete is permitted to fall upon the top of the concrete. If it does it will prevent the cap, or fine cement mortar, from uniting with the concrete and the cap will be loose and be liable to crack off to that extent.

Among the workmen are some requisites that cannot be written in the specifications. Oftener than otherwise among the common laborers will be found a better stripper than among expert carpenters. It is just a knack in setting the side rails for pavements and backs, fronts and divisions for curb and gutters, that some men have and others do not. Again, every mason and plasterer knows that there is much in the tempering of the mortar and a good mason or plasterer demands the services of some one whom he considers to be an expert at that work.

It is all in the look and the feel, and some men have the knack for it and others do not. Uusally it is best to employ an expert finisher, but, often, among the day laborers will be found a man who will readily get the knack of knowing just when to apply the float and just how to apply the trowel to get a fine finish upon the work. Here is where the city engineer gets in his fine work. It is in being able not to do the work himself, but to select, readily, the men who will do the work. Men do best that which they like best. The engineer should be able to detect that in a man which he likes best, and so can do best, and thus make his own work easy and sure.

To Councilmen I would say, cut out your superintendents. Usually political favorites, rarely with any practical knowledge, and wholly without any legal power, they are more a hindrance than a benefit to the work. Make your engineer responsible for good work. If he needs supervision assistants, let him select them and make him responsible for their acts.

Last, but not the least, I want to say something about the tamping and ramming. Both the tensile and the compressive strength of the work are largely dependent upon this one thing and everybody can not do it. The rammer is usually an iron plate with an upright handle. If this falls but a very little diagonally it stirs up the work instead of compacting it. Among any ten common laborers will be found at least one who will be found to have a knack at dropping the rammer square upon the work. He who can do this will have no jar from the handle to his arms, and the dread of the tool, which most laborers have, will entirely disappear. Such a man will do twice the work of others and do it well where others do it ill, and do it satisfactorily to himself.

Gentlemen, my story is told but I want to say something about the future of Portland cement. In crushed and screened "Blue hole" oolitic Indiana limestone, granite, marble and other fine building stones, you have the materials, which, combined with Portland cement and suitable sand, will produce better and finer effects in both internal and external architecture, than are produced by the natural stones, and at a much less cost. These artificial stones will receive as fine a polish as the natural stones, if you will but study how it is done.

About Repairs.—Where Portland cement work is broken, remove the broken part and cut away to a clean surface. Then dampen this clean surface and cover very lightly with dry cement and immediately apply the new material which is to take the place of the part removed, and finish as at first. If a part of the work becomes worn and presents a coarse, rough surface, it is because the finish coat was not properly tempered in the making of the work. The best remedy is to take equal parts of unslaked lime and Portland cement, and, within a spell of fine weather, sprinkle lightly all over the worn places, and leave it to be kicked about by the feet of passers-by until after a rain. Much surer effects will be attained by making several application than by applying all at once.

THE WATERPROOFING OF CONCRETE BLOCKS.

BY G. B. KIRWAN, ST. LOUIS, MO.

Our ancestors progressed from the Stone Age to the Iron Age; we seem to be passing from the Steel Age to the Cement Stone or Concrete Age. We tread on concrete walks, travel in concrete subways, over concrete bridges, live and work in concrete buildings, store our grain in concrete elevators, draw our water from concrete reservoirs and cisterns, sanitate our cities with concrete sewers and are finally buried in concrete cases, deposited in concrete tombs and our numerous virtues are inscribed on concrete monuments..

This gives an idea of the extent to which cement and concrete construction has become a necessary part of our existence and it is probably destined to be the most important feature in the building industry, provided its progress is not retarded by the failure of those engaged in it to live up to the full measure of their opportunities..

That the cement block system has made enormous strides in a very short time is due to the fact that it is strong and cheap and has great architectural adaptability, but whether this progress is permanent or not depends upon the makers of the blocks, on whom it is incumbent to produce a block that not only combines strength with beauty but is efficient in every partcular.

Dampness in buildings is one of the most potent sources of ill health and if concrete block buildings are more damp than those of brick, stone or wood, then the block business will correspondingly suffer..

A frame building is necessarily a dry building because in order to exclude cold or prevent the heavy leakage of heat a number of continuous air spaces are created, the enclosing walls of which are nearly always protected by tarred felt or coated building paper, which in itself is, to a degree, impervious to moisture.

It is not claimed that either brick or stone is impervious to moisture, consequently, architects and builders take special precautions to exclude dampness, but most of the makers of concrete blocks assert that the hollow space in the blocks attracts, by the process of capillary attraction, such moisture as is absorbed by the block, or, the air in the space dries the moisture before it can penetrate to the interior of the building; consequently both architect and builder make no provision to exclude dampness in such buildings, but depend entirely upon the hollow space for excluding moisture.

The reasons why a concrete block building is damp are many:

First. Concrete, whether rich in cement or compressed by hydraulic power will absorb more or less moisture.

No matter in what proportion cement and sand be mixed, the product will be a porous body, and whether blocks are faced, tamped, compressed by hydraulic power, or made rich throughout, the porosity is not destroyed, but merely diminished, therefore the absorption of moisture is not overcome.

Second. The hollow space, not being continuous, does not prove a barrier to the penetration of moisture as it will travel through the solid portions of the block.

With the exception of those blocks in which there are double air spaces, the hollow space does not entirely isolate the inner from the outer face of the block. Double air spaces accomplish this, but a single air space in order to do so must run from end to end, which means practically erecting two walls and creating a continuous air space between them. The system of erecting parallel walls has been for the most part abandoned because a given amount of material will not produce as strong a building, as when it is used in the form of hollow blocks. The object of creating a hollow space is to damp-proof and insulate, but a single air space only decreases the amount of dampness and does not exclude it absolutely.

Third. Air in the hollow space is not dry air, but on the contrary, becomes damp in a short time, thus destroying whatever efficiency the air space might have.

Dampness can result from three different causes, one of which is from poor insulations, resulting in air higher in temperature striking a wall much lower in temperature and condensing. For instance, the air space created by furring and lathing in a brick building is intended to serve two distinct purposes:

It isolates the plastered wall from the outside wall, thus keeping the plastered wall free from dampness..

The air in the space being a non-conductor, prevents the leakage of heat or penetration of cold, thus maintaining the plastered wall at a temperature high or low enough, as the case may be, to prevent air striking it from condensing.

The theory being that dry air confined will not conduct heat or cold, therefore, in winter artificial heat will remain inside and cold outside and cooler air inside the building. But, to accomplish this result, the air must be bone dry and confined. On the other hand, if the air is damp it will conduct readily, thus failing as an insulating medium and resulting in a colder house in winter and warmer in summer. If the transmission of heat is heavy enough then the temperature of the inner face of the wall is steadily reduced until it reaches a point low enough for condensation to begin, when there is a form of dampness which is usually referred to as a "sweaty" wall..

From this it must be deduced that the single air space in a block is of little value as an insulator, because it fails to completely exclude moisture. The double air space in a cement block may prevent dampness resulting from direct penetration, but as an insulator it fails because the air contained in the spaces become damp and consequently conducts readily.

Fourth. If moisture is attracted to the hollow space by the process of capillarity then damp air is the result.

Dampness in buildings caused by capillary action has been investigated with great care both by experiment and observation, but as yet it has not been determined what is responsible for this action, nor has it been explained by what process the moisture is attracted; therefore, it cannot fairly be claimed that the air space in a block attracts moisture through the agency of this mysterious force, but even if, through capillarity, the moisture absorbed by the block finds its way to the hollow space, then the air contained in this space becomes damp and the block fails as an insulating medium.

Dampness in buildings results either from direct penetration of moisture through porous bodies, resulting from rain beating on the outer face of a wall, or from the walls absorbing atmospheric moisture, or from warm air striking a cold wall and condensing.

The reason for dampness caused by direct penetration of moisture is obvious and that for condensation has already been explained, but why buildings situated on high ground and with apparently dry weather should be damp is not so generally understood.

Water is always present in the atmosphere. Water is soluble in air and when dissolved in it is as invisible as the air itself; when the proportion of water is greater than the air can dissolve the atmosphere is said to be damp; when the air can dissolve all the water the atmosphere is called dry notwithstanding that it still contains water.

The proportion of water soluble in air increases with the temperature of the air. When air nearly saturated with water is cooled some of the water is precipitated. During the heat of a warm day the atmosphere may be clear, bright and apparently dry, although it may contain as much water as the air is capable of dissolving at that temperature.

Whenever such air is cooled, as for instance, at sunset, it becomes unable to hold as much water as during the heat of the day and some of the water is discharged, becoming dew, mist or even rain, according to the degree and rapidity of the cooling process.

To demonstrate that moisture is present in air and that dampness is often due to walls absorbing this moisture, it is only necessary to make the following simple experiment.

Take a clean, dry glass bottle and seal it hermetically. Put it in ice and leave it there for about half an hour, then take it out, wipe off the outside and examine it. The inside will be covered with dew, which, if the experiment has been very successful, will form little streams of water and trickle down the sides. By means of a freezing mixture of ice and salt applied to the outside of the bottle, the dew will be transformed into frost. Take the bottle away from the ice, the frozen mixture will thaw quickly and the water will slowly disappear until the bottle has become empty and apparently dry as at first. The bottle was hermetically sealed so that nothing could get in or out, yet the water that appeared in it vanished again. All that was done to produce this result was to change the temperature.

This is what takes place on a small scale in the bottle. It is closed, but it contains air, which contains water. On reducing the temperature some of the water is released and when the temperature is reduced further it freezes. On exposing the bottle to the surrounding temperature the ice within it at first cools the air near the outside of the bottle. As the air inside rises in temperature the ice changes to water and then evaperates until the bottle appears as empty as at first. In a similar manner, dry walls become damp and damp walls become wet, small streams of water often trickling down the inside of the building..

F. W. Hagloch, C. E., has paid considerable attention to cement block construction, and in one of his many tests he found that the water absorbed in five hours by six different blocks amounted to so much that the penetration of moisture to the inner face of the blocks was a certainty, and he concluded from this test that some method of waterproofing is a necessity.

The tests made by Mr. Hagloch develop the fact that the hollow space in the block merely minimizes the amount of dampness without excluding it absolutely. In his opinion, making impervious blocks by the addition of sand is almost an impossibility for many reasons, one of which is, to quote him verbatim: "No positive formula can be given owing to the different sands and aggregates and different finenesses of cements requiring different proportions." from which we must conclude that ideal conditions are required, which are almost impossible to obtain.

There is only one way to insulate and damp-proof a building constructed of concrete blocks, and that is to make the blocks impervious to moisture. If this is done, not only is moisture prevented from entering a block, but the air contained in the cells of the block is protected against pressure from the outside; thus the block is constantly filled with air confined in small cells, which is acknowledged by all authorities to be the best non-conductor possible to obtain. Consequently the insulating power of cement and sand mixed in the form of concrete is maintained at its highest point of efficiency, and, assisted by an air space containing bone-dry air, a building easily kept cool in summer and warm in winter must result.

The absorption of moisture by stone, brick, cement or concrete ultimately results either in decay or disintegration, so that if the blocks can be made impervious, the mechanical action of water constantly rubbing against the particles of concrete and loosening them, thereby disintegrating the mass, or the action of chemically-charged moisture, which is responsible for decay, is entirely prevented.

If blocks could be troweled and finished off in a similar manner to sidewalks, there would be practically no penetration, but as this is impracticable in all cases where the object is to produce an imitation of rough-hewn stone, some other means must be adopted. The simplest method would seem to be to apply a water proofing liquid that will fill the pores of the stone and render them impervious to moisture. At the same time it must neither injure the ingredients of the block nor discolor the surface. It must not be affected by frost or drawn to the surface and evaporated by the heat of the sun. Various chemical compounds have been recommended and are being used by the makers of blocks, but in applying a waterproof coat care must be taken not to affect the strength or otherwise injure the blocks. The only material that is insoluble in water, that will resist chemical action, and, at the same time, will not injuriously affect concrete, is paraffine. The chief drawback to paraffine is that it requires mechanical means to apply which would so increase the expense of block making as to be practically prohibitive. If a vehicle can be found that will combine with paraffine so that the mixture can be applied without mechanical means; that is, simply with a brush like ordinary paint, then, in my opinion, the problem of making concrete blocks absolutely impervious to moisture will be solved.

WATERPROOFING CONCRETE.

BY W. H. FINLEY,

PRINCIPAL ASSISTANT ENGINEER, C. & N W. Ry.

Ever since concrete has entered so largely into the field of construction as a substitute for stone masonry there has been more or less discussion as to its permeability and various expedients have been resorted to to prevent the seepage of water through the material. This refers more particularly to the large masses of concrete built for engineering structures. I am aware that there has been more or less success in making concrete impervious to the action of water by various means, but do not think that any of them have given such satisfaction as to become generally used.

It is a question whether the addition of alum, soap and other extraneous material does not affect the lasting qualities of the concrete. If the announcement of the "Star-Stettin" Portland Cement Works that they are now manufacturing, according to a process invented in Germany, a waterproof cement which will become impervious to water. will resist the action of frost, heat, hot water, sea water and diluted acids, is borne out, the question of waterproofing concrete is settled for all time. However, concrete, as usually built in many engineering structures, is not impermeable to the action of water and some method of waterproofing the same, I think, is vitally necessary. That this is appreciated by engineers is clearly evidenced by the amount of waterproofing that is now being done on concrete arches, abutments, retaining walls, etc.

The writer has recommended for years the necessity of waterproofing both stone masonry and concrete structures where there was any danger of seepage of water, and believes that such a precaution will extend the life of the structure.

A recent examination of concrete abutments, retaining walls, etc., built in Chicago some years ago, disclosed the fact that water was seeping through the mass in several places, particularly along the parting planes where the work was not carried on continuously. This condition is frequently observed in concrete construction, and I think could be entirely prevented if the back of the structure was thoroughly waterproofed with asphalt.

Some years ago I had occasion to repair some masonry arches built in 1862 that were rapidly disintegrating owing to the infiltration of water. These arches were uncovered, the damaged stone replaced and the extrados of the arches were plastered with cement concrete and then thoroughly waterproofed with asphalt. Time has demonstrated that this work was very successful. I have since uncovered a number of arches that were leaking and found the concrete backing did not prevent the entrance of water. These were cleaned off and waterproofed with asphalt in each case. It is now the practice on a number of railroads to thoroughly waterproof all arches, abutments, retaining walls, etc. The method generally employed is to use as a first coat asphalt cut with naphtha, to be applied as a paint to the concrete after the same is perfectly dry, and then cover the surface with an asphaltic mastic composed of one part of asphalt to four of sand; this to be smoothed off with hot smoothing irons and thoroughly tamped and pressed into place. If the filling over the arch is ordinary gravel or dirt no other work will be necessary, but if it is filled with broken stone or stone chips it is better to cover the surface of the asphalt with washed roofing gravel, so that the broken stone will not cut or damage the asphalt surface. There are various other methods employed in waterproofing concrete surfaces with asphalt, such as the use of burlap or other fabric imbedded in the asphalt coating. It is very difficult to make hot asphalt adhere to a concrete surface however dry the same may be, unless it is heated by artificial means. Hot asphalt laid on ordinary dry concrete will not adhere and can be rolled up like a blanket after it has cooled. The writer has had some success in applying hot asphalt direct to concrete surfaces after the same had been dried and heated with hot sand but much prefers the use of the asphalt cut with naphtha applied as painting or as swabbing coat. The cost of this work, with present prices of first-class asphalt, will range from 10 to 20 cents per square foot, depending upon local conditions. It does not require any special expert knowledge for its application. After a brief coaching the forces as usually employed can produce a satisfactory job.

It might be well at this time to say something about the quality of the asphalt to be used for waterproofing purposes. In the past few years there has been a large development of asphalt for this purpose and it is now possible to get at a reasonable price a pure asphalt that will not flow under a temperature of 212 degrees and not become brittle when it is spread thin on glass at 15 degrees below zero. Also, it will resist the action of acids and alkalies.

The following specification is one that I have used with good results in waterproofing works.

1. Material—(a) Asphalt shall be used which is of the best grade. free from coal tar or any of its products, and that will not volatilize more than one-half of 1 per cent under a temperature of 300 degrees F. for 10 hours.

(b) It must not be affected by a 20 per cent solution of ammonia, a 35 per cent. solution of hydrochloric acid, a 25 per cent solution of sulphuric acid, nor by a saturated solution of sodium chloride.

2. Range of Temperature—(a) For metallic structures exposed to the direct rays of the sun, the asphalt should not flow under 212 degrees F. and should not become brittle at 15 degrees F. below zero when spread thin on glass.

(b) For structures underground, such as masonry arches, abutments, retaining walls, etc., a flow point of 185 degrees F. and a brittle point of zero will be required.

(c) The asphalt covering must not perceptibly indent when at a temperature of 130 degrees F. under a load at the rate of 15 pounds per square inch, and it must remain ductile at a temperature of 15 degrees F. below zero on metal structures and at zero F. on masonry structures underground.

3. Preparing Surface—(a) Before applying asphalt to a metal surface it is imperative that the metal be cleaned of all rust, loose scale and dirt and if previously coated with oil this must be burned off with benzine or by other suitable means. The metal surface must be warm to cause the asphalt to stick to it and the warming is best accomplished by covering it with heated sand, which should be swept back as the hot asphalt is applied.

(b) When waterproofing masonry structures, if the surface cannot be made dry and warm, it should be first coated with an asphalt paint made of asphalt reduced with naphtha. This is particularly necessary for vertical surfaces.

4. Preparing Asphalt—The asphalt should be heated in a suitable kettle to a temperature not exceeding 450 degrees F. If this is exceeded it may result in "pitching" the asphalt. Before the "pitching" point is reached, the vapor from the kettle is of a bluish tinge, which changes to a yellowish tinge after the danger point is passed. If this occurs the material should be tempered by the addition of fresh asphalt. The asphalt has been cooked sufficiently when a piece of wood can be put in and withdrawn without the asphalt clinging to it.

5. Application of Asphalt to Metal Surfaces—(a) The first coat should consist of a thin layer poured from buckets on the prepared surface and thoroughly mopped over.

(b) The second coat should consist of a mixture of clean sand or screenings, free from earthy admixtures, previously heated and dried, and asphalt in the proportion of 1 of asphalt to 3 or 4 of sand or screenings by volume; this is to be thoroughly mixed in the kettle and then spread out on the surface with warm smoothing irons, such as are used in laying asphalt streets.

(c) The finishing coat should consist of pure hot asphalt spread thinly and evenly over the entire surface, and then sprinkled with washed roofing gravel, torpedo sand or stone screenings to harden the top.

(d) The thickness of the coating will depend on the character of the work and may vary from three-fourths inch to two inches in thickness.

6. General—Where a quantity of asphaltic concrete is required, such as in through floors on bridges, a concrete should be made in the proportion of 1 part asphalt, 2 parts sand and 3 parts limestone screenings, thoroughly mixed and rammed into place with tamping irons on the first coat of pure asphalt with which the metal

was originally covered. At all drainage holes large-sized stone should be carefully placed by hand to insure perfect drainage.

It may not be out of place in discussing the question of waterproofing to call attention to the necessity for provisions for drainage in all concrete and masonry structures. This has not been given as much attention as it should receive. Whether waterproofing material is applied or not, the question of thoroughly draining the structure is of the greatest importance.

In ordinary building construction sufficient attention has not been given by architects and builders to the proper waterproofing of their foundation walls. I have observed recently in this vicinity a number of buildings in process of construction where the excavations for the cellar and lower foundations were made in a clayey material and concrete foundation walls put in without making any attempt to apply a waterproofing or damp proof coating to the wall or provide suitable drainage to carry off the ground water.

In this particular we are falling away behind even the early Roman architects and builders. In all the examples of their work it is evident they gave the greatest consideration in their construction to proper methods for keeping their foundation walls dry, and we cannot do better today in such matters than follow the advice of the great architect Vitruvius, who, writing about 25 years B. C. described methods of waterproofing and ventilating foundations walls that compare favorably with the best methods used today, excepting that we may have better materials for waterproofing than were known at that time.

Asphalt, I believe, makes the best damp-proof or waterproofing material that can be used in foundation walls and for all structures where such provison is necessary. It has been used from the earliest times for the purposes of protecting materials from air and water and we have examples of it in our museums where the mummy cases were sealed with this material more than 3,000 years ago.

I think the various makes of hollow concrete block offer a good field for the application of waterproofing. It is in line with the ideas of the early Romans in building hollow walls to take care of the question of dampness. I am of the opinion that these blocks laid up in asphalt and the surface next to the ground thoroughly coated with the same material make an ideal damp-proof wall.

I have found that the waterproofing qualities of asphalt, even when used under water pressure, are all that could be desired. When repairing a stone reservoir recently the following method was used: A single course of brick was laid up in the front of the wall, this brick being heated until the moisture was driven out, and then soaked in hot asphalt and laid in place, the space between the brick and the stone being filled with an asphaltic concrete of limestone screenings and asphalt in the proportion of about 1 to 4. These brick were anchored into the stone wall at intervals and the work has given very good satisfaction.

CEMENT POSTS.

BY J. A. MITCHELL, GOSHEN, IND.

In presenting this paper upon the subject of cement posts I speak from practical experience, and will briefly give my views upon the subject. The knowledge I have of cement posts was obtained from an experience of over three years in the manufacture of them.

The scarcity of timber suitable for fence posts has brought the question of using cement for posts to the front. In treating upon the subject of cement fence posts I shall put it under several different heads. The practicability of cement posts, mixing materials, reinforcing, fasteners for fence, molds, age before using, cost of manufacture, effect of cold or heat on the posts and tests of strength.

Practically it has been demonstrated in a number of localities that cement fence posts are a success, when properly constructed. I have seen cement posts that have been in the ground for over ten years and they were better than when first set. One hitching post I know that has been in constant use for 12 years is still perfectly sound. I have made thousands of cement posts, some of which have been set in the ground for over three years. I have never known a post to be broken after it was once set in the line of fence. After an experience of over three years of experimenting with and manufacturing cement posts I am convinced that they are the coming posts for fence purposes. They are practically indestructible as regards the elements.

Mixing Materials. Regarding the mixing of material for posts I will say that I have used both the dry and the wet or slush mixture in the manufacture of the posts, and have obtained good results from both, but I must say that I have made the neatest and the best post with the dry mixture, but it is a much slower way of making posts than by the wet mixture.

As to the proportion of cement and sand used in making posts one must be governed by the quality of sand used. I have used one to three, one to four and even one to five with varying results. There is such a thing as making a mixture too strong of cement. I tried half sand and half cement and the posts made in that way were an entire failure from some cause that I could not account for.

Reinforcing. A very essential feature in the manufacture of cement posts is the reinforcing. It is next to impossible to make a post without some sort of reinforcement and the success of your posts depends greatly upon the kind of reinforcement used. It is a mistaken idea that almost anything will answer for the interior of the post. Wood has been tried, but it positively will not do for the strengthening of cement posts. I have seen it tried at different times in the past seven years, but it has always resulted in failure. Metal is the only practical strengthener for reinforcing cement posts, and care must be used in selecting the proper kind of metal.

Galvanized metal should be used, round in shape. It is very hard to get a good post when flat metal is used. I have tried all kinds and find the round iron the best. Corrugated rods are very good.

Fastenings for Attaching the Fence to Posts. This is the one thing that has puzzled the manufacturer or would-be manufacturer of cement posts. Holes through the post were the first device for fastening the fence but there are two objections to the use of holes in the post. One is that the holes weaken the post and the other is it takes too long to make the holes in the post and the time required in putting ten holes in each post will amount to the time required to make the post. Eyes made of wire, hooks and staples imbedded in the cement have been tried for fasteners, but I find that the best fastener is the one that fastens the fence and post firmly and rigidly together. If the fence and post are so fastened together that it is impossible to move the post with the line of fence it is a great benefit to the post, as with such fastener it is almost impossible to break the post with the line of fence.

Molds. From the experience I have had, wooden molds are the best for forming the cement post. They are light, easily and cheaply made and last a long time if kept in the dry or under cover. The double mold, or two posts to the mold, I have found best, and the mold should be collapsible so that the post can be removed from mold in from 24 to 48 hours after making. I have molds that have been in use for three years and they are good yet. Molds cannot safely be removed from the posts until the concrete is set. The shape of the post renders it very liable to crack if handled before the cement sets. Iron molds are to heavy to handle and too expensive.

Age of Post Before Use. From practical tests I find that posts can be safely set in line of fence at the age of 30 days, yet 60 days is better and it would be still better if the posts could be kept for six months before setting in line of fence, for they would then be thoroughly cured, seasoned and hard, although I have set posts that were only two weeks old with good results, but it is very risky setting and shipping them at that age. Posts are called thoroughly cured in 60 days, but I find them at the age of one year three times as strong as at 60 days.

Cost of Manufacture. Posts can be manufactured at a cost of from 11 to 12½ ecnts each, counting cement at $1.50 per barrel, gravel at 40 cents per yard, metal at 2¾ cents per pound and labor at $1.50 per day. Some persons who are selling farm rights represent that posts can be made for 7 cents, when the cement alone costs 5 to 6 cents. Two men will make 100 posts per day, while three good men can make 175 to 200 per day. The more men that are used working together, the less the cost per post for labor.

Effect of Cold or Heat. It has been a question with some persons as to whether a cement post would stand freezing weather, they contending that a rainy, sleety time followed by a hard freeze would burst the post on account of the post taking up so much water, but this is a mistaken idea. I have put the posts to all kinds of tests and exposed them in every way to all kinds of weather. I have set them in the ground where the water would stand of a wet time and have had it freeze to a depth of two feet or more where this water stood without affecting the post in the least. I have left them lying on the ground singly and in stacks all winter; have known an inch and a half of ice to freeze on top of a pile of posts and I have cut the ice off of the top of a pile of posts that I wanted to ship and found them in the best condition. These tests of cold were made in Michigan, where they had ice last winter two feet thick. I shipped three car loads in January, 1904, that the workmen had to shovel over two feet of snow off of and then cut at least an inch of ice from the top layers. In this lot of 1,600 posts there were 8 damaged posts, and they were not damaged so much but what they were used and we were allowed half price for them. The cold weather has no effect on them whatever, neither does the heat. I burned some pieces of a broken post in my stove last winter all winter, using them for firebrick, and they were as good in the spring as they were when I put them in the stove. One great advantage of cement over the wood post is that there is no danger of burning the post if the fence row burns out, as is often the case along railroads.

Strength. I have tested the strength of the post in several different ways. Have tested them in the line of fence, the end posts with a pull of at least five tons without breaking. Have had them tested with the best wire fence stretchers that are in use with 55-inch fence of hard steel galvanized wire, and never had a break. I have tried them with something under each end and a dead weight of over 800 pounds between the supports without breaking. Have put them to a scale test by using one as a lever with the fulcrum on the platform of scales, the scale beam showing a weight of over 700 pounds without breaking. They stand shipping splendidly and they can be hauled any distance and over any kind of road.

In conclusion I will say that after an experience of over three years in the manufacture of cement posts, they are a success as a post and they can be manufactured and sold at a good profit and at a price lower than is asked for a good wood post. The main thing is in knowing how to make them. I have had no trouble in selling all the posts that I could get made and at a good price, retailing them at 30 and 35 cents for the small or line posts and $3 each for the end and corner posts.

MORTAR SAND.

BY J. C. HAIN, ENGINEER OF MASONRY CONSTRUCTION,
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Can anything new be said about sand? The less experienced know what sand is suitable for mortar, and what is not. The Romans made concrete 2000 years ago, and were familiar with the requirements of a good sand, one of its important ingredients. Clean, coarse, sharp sand is generally conceded to be the best. With this in view, it is not surprising that apparently little can be said. Although the subject may seem to have been decided thousands of years ago, I still believe there is much to be learned. I can best illustrate my stand by calling your attention to a few sands, with more or less peculiarities, and compare their laboratory tests with a standard.

Allow me briefly to explain the conditions which led to these tests. The Bridge Department of the Chicago, Milwaukee & St. Paul Railway Co., Mr. C. F. Loweth, Engineer and Superintendent, with whom I am employed in charge of the masonry, requires large quantities of sand in its substructures and culverts, which are principally built of concrete. In the last six years, we used a maximum per year of about 85,000 barrels and a minimum of about 50,000 barrels of cement. This will give you an idea of the amount of sand required yearly. The sand comes from numerous sources over the entire system of 7,000 miles, most of which are company sand pits. The problem before us was one of selecting the most suitable sand with the least haul. This led to laboratory tests of questionable sands. In many instances these tests were a great surprise to us. I will call your attention to some of the most peculiar of these.

Before doing so, I will briefly explain the tests. A 1 to 3 mixture was used throughout, except where neat cement is specified. Each tensile test represents the average of three briquettes, except in cases where one appeared exceptionally irregular in which case it was thrown out. The different sands are grouped in the tabulation because each was tested with a different lot of Portland cement, as well as a different sample of the St. Paul standard sand. For these reasons. not only the test in pounds is given, but also the percentage any test is of the corresponding standard test. Thus the percentages give a basis of comparison between the sands of different groups. The neat tests are also shown for comparison. All tests were extended to three years. Those not shown are still to be made.

One of the early questionable sands which needed our consideration was a bank sand of glacial deposit, found near Elkhart Lake, Wisconsin, tests of which are tabulated. On first observation its fineness seemed to be the greatest objection. It contained some coarse particles, but the fine ones were in excess. Ninty-two per cent passed through a No. 50 sieve, while only 54 per cent and 11 per cent, respectively, of the St. Paul Standard passed through these same sieves. In other words, on these two sieves, Elkhart Lake sand showed up twice as fine as the standard. However on closer examination a more striking peculiarity developed, which seemed even more objectionable than its fineness. Apparently the sand bank was a deposit of broken shells because it could be easily ground into very fine particles by rubbing them between two hard objects. When examined under a micrscope it appeared to consist of fine grains of silica with rounded, smooth surfaces, mixed with larger particles of softer material with sharper corners which probably consisted of shells or a soft limestone. (Evidently the silica crystals had been worn round and smooth before the shell-like mixture was added.) While the larger chalk-like particles seemed to be soft, the silica was also easily crushed, but not so readily. When treated with hydrochloric acid it gave off a strong effervescence, indicating that we were probably correct in the supposition that it contained shells or limestone.

We had a particularly important job in the near vicinity where we wanted to use this sand, because this was the only available pit for several hundred miles. Though sand from this pit had been used for building purposes for years. the question arose whether we were safe in using it for the concrete center pier of a draw span. A laboratory test was made in connection with our St. Paul standard sand for comparison. The results are shown in the table. While the Elkhart Lake sand tests vary from 60 per cent to 99 per cent of the standard, it averages throughout the tests up to 2 years about 73 per cent of the standard, which is a very good showing, considering everything. To make the comparison clearer, Ottawa sand, which was favorably recommended by the American Society of Civil Engineers as a desirable standard, developed an average strength of 80 per cent of our standard, up to two years. From this it appears that the fine shell-like sand from Elkhart Lake differs only by 7 per cent from the standard sand recommended by the American Society. At all events we decided to use it for the important job above referred to. The center pier in question was built from it and the pier stands today as an excellent piece of concrete work which has plenty of life and ring.

My opinion of this soft, fine sand has improved. The laboratory tests were much better than I expected. The character of the concrete made from it appeared to be all that could be desired. An excessive haul was saved by using it. On the other hand, I am not in favor of using a sand of this character without first making laboratory tests. All soft, fine sands do not act alike.

Another sand in this same glacial district which was still more of a surprise than the above, was the Pound sand, tests of which are platted and tabulated. It noticeable peculiarity was the presence of foreign material resembling clay. The damp sand when taken from the face of the bank was plastic and readily caked in the hand like putty. The particles of silica were held together by the clay. A coating of fine material clung to the hand after handling it. To one accustomed to the usual specifications for a clean sand, free from foreign substances, this would fall far from being satisfactory. Laboratory tests were made, extending to three years. These tests, to our surprise, proved to be superior in every respect to our standard sand. The 7 and 23-day tests of this were respectively 40 per cent and 30 per cent above the standard. The difference became less with age, although the three-year test was 20 per cent above the standard. This surely was contrary to the then general impression of a good sand, especially at the time these tests were started. The sand was found to contain 7.7 per cent of fine material by decantation; that is, material held in suspension, all of which was perhaps clay. There appeared to be no other peculiarity, and hence it was thought that this clay was beneficial to the sand. At all events, the sand tested so well that it was considered perfectly safe to use it for ordinary concrete purposes. The quesion of using it under water, where clay might retard the setting, was not gone into.

I wish next to call your attention to Eagle No. 1 and No. 2 sands, shown in the diagram and tabulation. The former contained 3.2 per cent of material held in suspension, while the latter contained 15.7. Eagle No. 1 was selected for the best sand in the pit and No. 2 for the poorest. Both sands seemed questionable. Before tests were made we even doubted the advisability of using any sand from this pit, but decided to order out a shipment of the best (No. 1) for an unimportant job and follow with tests. The tests proved the unexpected. To our surprise, both tested well, and what was a still greater surprise, the No. 1 Eagle, which contained 3.2 per cent of clay, showed up poorer than the No. 2, which contained 15.7 per cent. The particular sample of St. Paul standard sand with which they were compared contained 3.4 per cent of material held in suspension, largely clay. The strength of all three sands, while irregular, appeared to be governed largely by the amount of material held in suspension, or, in other words, the amount of clay. We surely were mistaken in our first estimate of these sands.

Still another test, which proved the superiority of clay in sand in a different way, was the Jackson (Minn.) pit sand, one sample of which was washed and one not. The unwashed showed up about 25 per cent superior, although it contained 6 per cent of clay. On the other hand, the washed sand averaged considerably below our standard, about 30 per cent, and the unwashed a trifle below, though very close to it. This comparison to the standard sand is contrary to what we found in the previous sands from the Eagle pit, because the unwashed Jackson sand, which contained 6 per cent of clay, did not test better than the standard sand, which contained only 1 per cent. But, looking furher, however, and comparing the fineness of the Jackson and standard sand, as per tabulation, it will be seen that the standard is a much more desirable mixture of fine and coarse particles, which the writer believes accounts for the discrepancy, and which will be touched upon later. This is another example where the presence of clay improved the sand.

The above tests of sands containing clay in their natural state, as well as many others which I have not taken time to mention, tend to prove that the presence of small percentages of clay is not objectionable, but, on the other hand, may be desirable. This, however, does not prove that sand containing ordinary soil is better than one without it. To decide this, we made a series of tests of washed sand to which was artificially added 2, 5, 10 and 20 per cent of rich surface soil consisting principally of decayed organic matter. The soil was taken from the bank of the Chicago River, where undisturbed weeds had thrived and decomposed season after season, and had made the richest kind of soil. The results were disappointing. They were neither decidedly inferior nor superior, but proved quite irregular. The tests up to two years showed that the percentage of soil added did not cause the tests to follow any definite law. The 20 per cent. adulteration had comparatively little different effect than the 2 per cent. As a whole, the average strength of the tests up to two years was about the same as the clean test, but the irregularity was so great as to make the artificial sands less desirable than the natural. It would seem from this that sand with a small admixture of soil ought not be condemned without first making tests, but, on the other hand, it is not as desirable as one without soil. Sands of this character (ones containing soil which consists of decomposed vegetable matter) are rarely found in nature. The soil simply overlays the sand pits, and can be easily stripped off. A rare case of river deposit might occur which contained soil, though this is contrary to expectation because of the difference in specific gravity of the sand and soil. The two are seldom deposited together. The natural sands are generally found mixed with clay, which consists of decomposed rock.

Let me refer you to an article published in the Engineering News of Nov. 19, 1903, by Prof. C. E. Sherman of the Ohio State University, in which he reports laboratory tests up to one year of Portland cement, with different sands mixed with 0, 2, 4, 8, 10 and 15 per cent (by weight) of clay and also loam. With very few exceptions, the adulterated sand tested superior to the natural sand. In most cases the 10 and 15 per cent mixtures tested quite uniformly and proved superior by, roughly, 25 per cent. With one exception the clay showed up slightly better than the loam mixtures.

His artificial clay-sand tests proved the same as our observations of natural sand obtaining clay. His artificial loam-sand tested superior to our artificial soil-loam. This latter difference is perhaps due to the difference in character of the material added. He describes the loam as "a common field soil obtained from the field north of the power house on the State University campus." Quite probably, in place of all decomposed material, it contained some clay, and possibly also some sand. This is the only way I can account for the superior comparative showing of the loam tests he made over our comparative soil tests. A small quantity of clay in the loam would change the results.

I will add here that there are two ways in which foreign material occurs in sand banks, one in the form of a fine material, uniformly distributed throughout it, and another in the form of layers or pockets which are entirely distinct from the sand. The cases mentioned, both natural and artificial, were the former. A specification which permits a definite amount of foreign material must, however, exclude all sand in which such material is not uniformly distributed throughout the sand, or, in other words, a part of it.

There are still other peculiar sands to be met with in nature. Your attention is especially called to one other natural sand which seemed to me most striking. It was excavated in Kansas City on the location of a freight house foundation, which in the flood of 1903 was several feet under water. From appearance and action it was hard to determine whether it contained a larger percentage of sand or clay. What grains it contained were so fine that they were scarcely perceptible to the touch. The quantity of clay seemed large because the trenches stood perfectly vertical under ordinary conditions. From the grit, I concluded it was sand, with a regular large percentage of clay. Tests were made of it and up to date we have the one year results. It proved to be a very fine sand which contained about 12 per cent of material in suspension, largely clay. The most striking peculiarity was its fineness. Everything passed through a No. 100 sieve and 93 per cent passed a No. 200. In fineness it was far superior to cement. I know of only one cement which is guaranteed 85 per cent in fineness on a No. 200 sieve. The usual specifications require about 75 per cent. Under an ordinary lens the grains of this sand were not visible. They appeared to be mostly smooth grains of silica.

The tests proved as interesting as the fineness. The early ones were low. The 7 and 28-day averaged about 53 per cent of the standard. The three months showed a good gain, while the six months and one year averaged about 77 per cent of the St. Paul standard, which is about the same showing made by the Ottawa sand recommended as a standard by the American Society of Civil Engineers. The 12 per cent of foreign material, presumably clay, quite likely helped to improve the tests. I consider that this fine sand shows up remarkably well, in view of the fact that it is finer than the finest cement, and that 93 per cent passed a No. 200 sieve. It quite likely could be used in massive masonry, were it possible to allow the concrete to set for a year before subjecting it to severe strains.

I might call your attention to many other sands from along our line, which have been tested in our laboratory. The foregoing, however, illustrates the peculiarities most strikingly. Before concluding I wish to say a little more in regard to the effect of washing, and, also the effect of fineness on sands in general.

It will be remembered that the washed Jackson sand tested inferior to the unwashed, which contained 6 per cent of clay. The washing was done according to the laboratory practice (decantation). Immersed sand was shaken up in a water bottle and allowed to settle. The portion held in suspension was poured off. This process was continued until nothing was held in suspension. It will be seen that this method of washing differs widely from the regular practice used at the sand pits. It is my opinion that the Jackson sand would not have tested as well had it been subjected to regular washing in place of the laboratory method. The finer particles of sand would have been carried off with the clay. This would have left larger voids in the sand, and consequently it would not have tested as satisfactorily. (I will bring this out more clearly in the discussion of the fineness.) Therefore, I believe that washing, on general principles, is not desirable unless conditions are unusual. At all events, the sand should be tested washed and unwashed before going to the expense of fitting up a plant for washing. Unless the sand naturally contains an excess of fine particles or of foreign substances, I doubt if washing will better it.

Next in regard to the distribution of fine and coarse particles. A study of the table of fineness will show that the strength of a sand depends to a considerable extent on the proper distribution of the fine and coarse particles. The Ottawa sand, which was favorably recommended by the American Sociey of Civil Engineers, does not test well because its fineness is limited between a No. 20 and a No. 30 sieve. It is natural to expect that the absence of small grains leaves larger unfilled voids, and consequently the tests are not as strong. Tests of this sand only averaged about 80 per cent of the St. Paul stanadrd. I attributed the good showing of our standard largely to the better distribution of the different-sized particles.

It is difficult to decide what distribution of grains would be most suitable. Please note, however, that the meshes of one sieve are about one-quarter the size of the next larger sieve, and that if there are 40 per cent of voids in the sand held between two seives there ought to be about the same amount of sand held between the next smaller-sized sieves, or enough to fill these voids, etc. On this assumption. I have figured out and tabulated the fineness of a sand that ought to give the best results. A sand might vary from this considerably and yet not alter results materially, because some other distribution of particles might result in as few voids, with only a slight increase in the surfaces to be coated with cement.

By comparing the excavated Kansas City sand with the fine "Track Elevation" sand, both of which are shown in the tabulation, it will be seen that the finer of the two, though it is much finer and hence has considerably more surface, tested better. This I think is partially accounted for by the undesirable distribution of the particles in the "Track Elevation" sand. Eighty-three per cent of the latter sand is held between a No. 50 and a No. 100 sieve, and the percentage of fine particles below this is not enough to fill the voids. See table. However, as stated in the earlier part of this paper, the fine flour-like sand has the advantage of 12 per cent clay, but this alone, in my judgment, does not account for the difference in showing. I also attribute the low tests of the Rockton sand shown in the tabulation to the same cause. There are not enough fine grains below the No. 50 sieve to fill the voids of larger particles. We have made a great many other tests, which tend to prove that this supposition is correct, but which I will not take time to go into.

To sum up the situation, it is quite evident that clay in limited quantities (say not to exceed 12 per cent) is beneficial if thoroughly distributed throughout the sand. Before using, however, it ought to be compared with an established standard.

Soil, on the other hand, is detrimental. Sand containing it shows up irregularly. Such sand should prove satisfactory by tests before using.

Washed sand may be less desirable than unwashed. Washing removes the particles as well as the foreign material. The fine grains, if not in excess, are needed to fill the voids of the larger.

The only safe way to decide whether sand ought to be washed would be to test it under both conditions.

A fine sand may show up well if the grains are well graded. A coarse sand may show up poorly if there are too few fine particles to fill the voids. The best graded sand is one in which the grains held on a uniform series of sieves are so arranged that the voids in one lot are filled, and not overfilled, by the grains in the next smaller size, and so on. This grading should begin with large grains in order to limit the surfaces exposed to cement, and still these grains must not be so large that the voids will not be filled with the smaller particles.

Briefly, then, the best mortar sand found in nature is one with sharp corners, rough surfaces, with grains neither coarse, medium nor fine, but with the proper mixture of all these sized particles which will result in the least voids. The sand also should not be washed but may contain up to 12 per cent of clay which will not injure, but will perhaps improve it.

TENSILE AND FINENESS TESTS OF SAND.

Sand.			Seven days.		Twenty-eight days.		Three months.		Six months.		One year.		Two years.		Three years.		Average per cent. of standard.	Per cent. by decantation (held in suspension).	Per cent. by weight of sand passing through and held between the following sieves.										
Name.	Deposit.	State.	Tension in pounds.	Per cent. of standard.	Tension in pounds.	Per cent. of standard.	Tension in pounds.	Per cent. of standard.	Tension in pounds.	Per cent. of standard.	Tension in pounds.	Per cent. of standard.	Tension in pounds.	Per cent. of standard.	Tension in pounds.	Per cent. of standard.			Per cent. through No. 8.	Per cent. between Nos. 8 and 12.	Per cent. through No. 12.	Per cent. between Nos. 12 and 24.	Per cent. through No. 24.	Per cent. between Nos. 24 and 50.	Per cent. through No. 50.	Per cent. between Nos. 50 and 100.	Per cent. through No. 100.	Per cent. between Nos. 100 and 200.	Per cent. through No. 200.
GROUP I.																													
Elkhart Lake	Glacial	Wis.	105	71	174	99	220	69	268	71	258	60	279	82			78	0.9	100.0	0.5	99.5	7.2	92.3	64.6	27.7	23.5	3.8	2.9	0.9
"St. Paul Standard"	Glacial	Ill.	147		176		319		379		433		340					0.9	100.0	14.9	85.1	31.6	53.5	42.3	11.2	8.7	2.5	1.1	1.4
Neat Portland Cement			687		699		838		837		757		752												99.3	9.8	90.0	14.5	75.5
GROUP II.																													
Eagle, No. 1	Glacial	Wis.	128	108	185	97	239	98	302	105	328	108	332	92	382	102	101	3.2	No fineness tests made.										
Eagle, No. 2	Glacial	Wis.	141	118	208	109	278	114	342	119	392	129	442	123	472	126	121	15.7											
Pound	Glacial	Wis.	166	139	248	130	299	123	357	124	413	136	429	119	445	119	126	7.7											
Rockton	Glacial	Ill.	116	97	147	77	209	86	241	84	240	79	283	79			82	2.5	100.0	3.6	96.4	21.4	75.0	55.0	20.0	10.0	10.0	8.0	2.0
"St. Paul Standard"	Glacial	Ill.	119		191		243		288		303		360		373			3.4	100.0	13.5	86.5	31.7	54.8	41.1	13.7	8.8	4.9	1.2	3.7
Neat Portland Cement			533		596		629		646		632		737		744										99.4	8.3	91.1	11.5	79.6
GROUP III.																													
Jackson (not washed)	Glacial	Minn.	185	116	223	81	290	88	359	88	377	91	428	99			91	6.0	100.0	10.3	89.7	62.5	27.2	25.0	2.2	1.2	1.0	0.7	0.3
Jackson (washed)	Glacial	Minn.	140	88	181	65	227	69	235	58	303	73	314	72			69	0.0	100.0	6.3	93.7	49.4	44.3	34.3	10.0	9.2	0.8	0.3	0.5
"St. Paul Standard"	Glacial	Ill.	159		277		330		406		413		433					1.1	100.0	9.2	90.8	34.4	56.4	47.4	9.0	7.7	1.3	0.6	0.7
Neat Portland Cement			654		710		748		687		818		925												99.6	8.9	90.7	13.9	76.8
GROUP IV.																													
"St. Paul Standard" (washed)	Glacial	Ill.			292		361		384		430		435		493			0.0	100.0	0.8	93.7	49.4	44.3	34.3	10.0	9.2	0.8	0.3	0.5
"St. Paul Standard" (2% soil)	Glacial	Ill.			257		390		418		458		431		479			2.0	Same sand used with exception of soil that was added.										
"St. Paul Standard" (5% soil)	Glacial	Ill.			248		348		352		491		414		422			5.0											
"St. Paul Standard" (10% soil)	Glacial	Ill.			242		335		379		506		417		499			10.0											
"St. Paul Standard" (20% soil)	Glacial	Ill.			299		334		368		515		414		431			20.0											
Neat Portland Cement					825		841		712		735		713		834														
GROUP V.																													
Excavated Kansas City	River	Mo.	52	84	92	40	141	84	244	77	263	77					61	11.9	100.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	6.8	93.2
Missouri River Kansas City	River	Mo.	120	78	174	77	261	100	306	97	312	92					91	0.3	100.0	0.0	100.0	2.0	98.0	82.5	15.5	14.0	1.5	0.5	1.0
"St. Paul Standard"	Glacial	Ill.	158		227		261		815		340							1.1	100.0	9.2	90.8	34.4	56.4	47.4	9.0	7.7	1.3	0.6	0.7
Neat Portland Cement			555		627		650		741		712																92.5	19.3	73.2
GROUP VI.																													
Fine Track Elevation	Wind	Ind.			170	58	201	55	201	52	271	63	243	56	238	59	58	0.3	100.0	0.0	100.0	0.0	100.0	5.7	94.3	83.2	11.1	10.9	0.2
"St. Paul Standard" (washed)	Glacial	Ill.			292		361		384		430		435		403			0.0	100.0	8.2	91.8	34.5	57.8	48.5	8.8	8.0	0.8	0.4	0.4
Neat Portland Cement					689		667		727		801		604		727												98.7		
GROUP VII																													
Possible Ideal Sand (in fineness)																			100.0	60.4	89.6	24.1	15.5	9.6	5.9	3.8	2.1	1.5	0.6

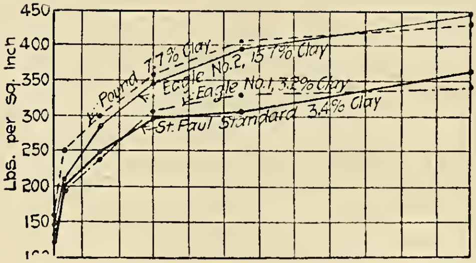

Fig. 1 Tensile Tests of 1 to 3 Mortar, with Pit Sand Containing Clay. (See Group II. in Table.)

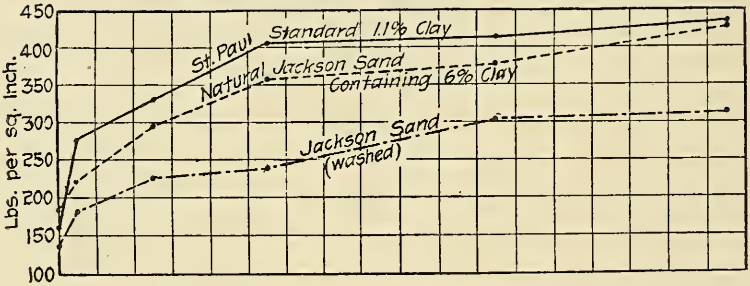

FIG. 2. TENSILE TESTS OF 1 TO 3 MORTAR WITH JACKSON SAND, WASHED AND UNWASHED. (See Group III. in Table.)

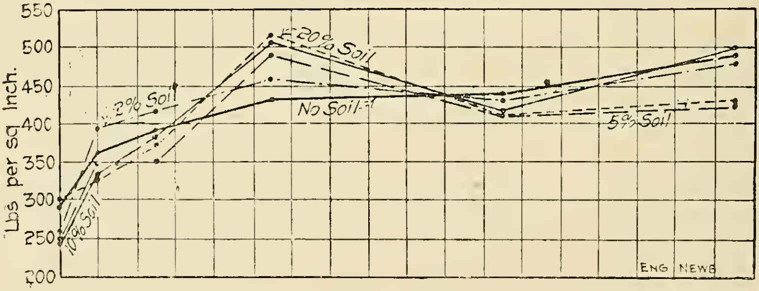

FIG. 3 TENSILE TESTS OF 1 TO 3 MORTAR WITH "ST. PAUL STANDARD SAND" MIXED WITH SOIL. (See Group IV. in Table.)

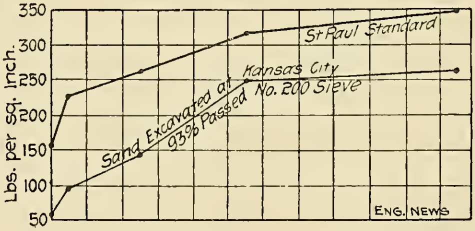

Fig. 4. Tensile Tests of 1 to 3 Mortar with Extremely Fine Sand. (See Group V. in Table.)

PROCEEDINGS

OF THE

FIRST CONVENTION

OF THE

National Association of Cement Users

HELD AT

INDIANAPOLIS, INDIANA

January 17, 18 and 19, 1905.

TUESDAY AFTERNOON, JANUARY 17, 1905.

The convention was called to order in the auditorium of the Claypool Hotel, Indianapolis, by Charles Carroll Brown who said:

I think the number of men here today is a sufficient reason for the calling of this convention, but it may be of interest to you to give a short sketch of the way in which the convention was gathered together, and the reasons for doing so. You all know how rapidly the use of cement has spread in the last few years. The cement manufacture of this country has doubled every four years for some time, and last year the amount was something over twenty-three million barrels. The use of cement is not so simple as it might seem, and much bad work has resulted as a consequence of many people trying to manufacture cement products who know nothing about the materials with which they have to work. The engineering magazines have shown what has happened along these lines. The first illustrated description of cement blocks appeared in a magazine three years ago this month. There was only one machine in existence, so far as I know, at that time, and there were hardly a dozen in use at that time.

We have here twenty-one machines on exhibit, which is not half of the number on the market, and the number of users of cement block machines has increased even more rapidly. Our last count of the list of operators of machines is over sixteen hundred, and I have no doubt there are a great many more, because we are getting additions to the list every day.

Some of these men with myself called attention some time ago to the necessity of paying more attention to the requirements of buildings. There are two sides to this question, one, the necessity of the block maker to pay some attention to the building into which it is to go, and second, the necessity of the architect paying some attention to the material of which the building is to be constructed. The architect and block maker must get together. Some time last summer Mr. A. S. J. Gammon, of Virginia, who is interested in the making and use of these blocks, wrote me and suggested a convention of the block makers, and I took the matter up and have been writing about it ever since. Every number of our magazine has had something about this convention. I have myself sent out a great many circular letters pertaining to this convention to different people trying to find out what was wanted in the way of a convention, and as to the time of meeting and so on. The result is this convention today. I consumed considerable time in the work especially after I went to St. Louis to the Exhibition and found the amount of cement work that was on hand there. I also found that Mr. John P. Given, of Circleville, Ohio, had been working on it to quite an extent. He had not yet gone into the subject very widely by publication but he had been in communication with quite a number of people who were very anxious to have a convention of this sort. We found out who were interested in this subject at St. Louis, and decided at that time as the result of our discussion and the answers to the letters which had come in, that we would hold this convention here, the majority being for Indianapolis as the place, and for January as the time.

At the start only the block makers were interested, but it was only a short time until I found that other cement users were just as interested in the convention as the block makers were, and there are a great many men here today who are interested in other lines of cement work. The block business is a business which has grown very largely, but it is far from being the most extensive use of cement in this country, or the most important, and this association will be very much larger than if restricted simply to the block trade. It will cover the entire field of the uses of cement.

In making plans for the convention and casting around for a man to nominate for temporary chairman of this convention,—until a permanent organization is completed,—I tried to find a man with the interests of cement at heart, as broad minded as possible, and who would be impartial. My acquaintance does not cover the entire field, but I was fortunate enough to find a man who, it seems to me, fills the requirements, and he also has a wide acquaintance among cement workers, and I therefore take great pleasure in nominating as temporary chairman of the convention a man who is as interested in this convention and is as desirous of its success as anyone could be, John P. Given, of Circleville, Ohio.

A. S. J. GAMMON:—I second that nomination.

The motion was carried. Mr. Given in taking the chair said:

Gentlemen of this Convention:—It is certainly a great pleasure to me to be selected to be the presiding officer of this meeting of such a body of intelligent business men. This convention has been on my mind ever since October when Mr. Brown and I met in St. Louis. We have corresponded considerably and talked with each other planning to make this convention a success, and it delights me, and I likewise think that every individual on this floor is delighted in the success so far attained. There is no reason, gentlemen, why this Association should not become one of the largest associations of this character in the country. I feel that, as large as it is today, with concerted action our success is assured.

We have tried in making this call to take in the various parts and divisions that will be necessary to make this convention as wide reaching as possible. We want to cover every line; we want to cover the monolithic and reinforced concrete work, and when you take into consideration the wide scope which this convention covers, you must certainly know that it will take concerted action on the part of those who are interested. There is no reason why this should not be brought about, and brought about in a splendid manner. You know the Psalmist says: "Behold how good and how pleasant it is for brethren to dwell together in unity." Now this, gentlemen, should be one of our motives, that we should dwell together in unity. We must not forget to live in harmony; harmony should prevail.

MR. SWIFT:—If it is in order, and we have to have a temporary secretary for this meeting, I take pleasure in nominating Mr. Charles C. Brown, as secretary.

The motion was seconded, voted upon and carried.

CHAIRMAN GIVEN:—The first matter in order that occurs to me will be the selection of a committee on the Constitution and By-Laws. Has anyone any suggestions to offer?

MR. GAMMON:—I make a motion that the chairman appoint a committee of as many as he deems best to work on the Constitution and By-Laws.

The motion was voted upon and carried.

MR. SWIFT:—In order to expedite matters in this meeting, I move you that the chairman appoint a committee of five who shall be the nominating committee, who shall select a set of officers to be voted upon at this meeting for the purpose of selecting our officers for the coming year.

——— ———:---I think it will simplify matters considerably to have but one committee. The committee on Constitution and By-Laws can suggest the permanent officers for this organization. You must remember it is only a short time between now and the evening session.

CHAIRMAN GIVEN:—You will observe the necessity of something of this character from the fact that we, many of us here, are mostly strangers, and also in order to bring about the best results it would be well to make your selection of these officers early, who I trust, will be men of ability who can carry the association through successfully.

MERRILL WATSON:—I would like to suggest that a committee be appointed whose title is "Plan and Scope" so that the purpose is that the duties be divided and I would therefore suggest that there be two committees of five each to report on the Constitution and By-Laws, and the other five on the list of officers. I think they should first determine the plan and scope of this Association. I feel that this scope in very wide, and its influence should be very wide,—in fact wide enough to make a half dozen associations. We have started together to make one large association, and the foundation laid should be very broad, and it will not matter then whether they reinforce it or not.

CHAIRMAN GIVEN:—We will now vote on the gentleman's motion.

The motion was voted on and carried.

MR. SWIFT:—The motion was that there should be two committees which consisted of five members each which would be the same as one committee consisting of ten members.

C. C. BROWN:—We have two committees already appointed; and it seems to me that they could easily be instructed by this meeting to act together and thus form the committee on the plan and scope which Mr. Watson suggests. It seems to me that this would be the easiest way out of it.

MERRILL WATSON:—I ask that these two committees be consolidated into a committee of ten and that their work be the Plan and Scope for this Association.

MR. SWIFT:—I will accept that amendment, Mr. President.

The vote was taken and carried.

CHAIRMAN GIVEN:—I shall now appoint this committee of ten. I shall appoint:

E. B. Swift, of Indianapolis, Ind.;
W. H. Phillips, of Columbus, Ohio;
Ernest McCullough, of Chicago, Ill.;
George H. Carlin;
W. E. Horn, of Memphis, Tenn.;
A. S. J. Gammon, of Norfolk, Va.;
J. P. Sherer, of Milwaukee, Wis.
George L. Stanley, of Ashtabula, O.;
C. B. Brime, Berney;
A. M. Baumberger, St. Louis, Mo.

The committee was excused to begin its labors and the printed program of papers was taken up.

THE SECRETARY:—I find that Mr. Humphrey has a stereopticon on which he can show us some pictures which will be of great assistance to us, and I have therefore thought it best to change his paper to this evening and put on the program here the paper on the Coloring of Cement, by Mr. J. P. Sherer, of Milwaukee, Wisconsin.

MR. J. P. SHERER:—I believe I was appointed on that committee, but if I can be excused a short time I will read you this paper.

Mr. Sherer read the paper which will be found on page 11.

The discussion of the paper followed:

E. H. HOTCHKISS, Chicago, Illinois:—I would like to know if this gentleman who has just read the paper said that it would take seven pounds of oxide of iron to a cubic foot of concrete?

CHARIMAN GIVEN:—That is correct.

E. H. HOTCHKISS:—Then the only thing I have to say is that the other fellow will get the job.

————————:—I want to learn how much oxide you put with one hundred pounds of cement to make a good color. I have not learned that yet, and I should like to know if someone can tell me.

——————————:--I too, would like to have some light on this subject. For about seven years we have been making mortar color, not for coloring cement blocks, so I do not have any axe to grind. We have been mixing mortar for setting brick and stone, and it has been our experience that the mortar requires about sixty pounds of coloring. Mr. Sherer made a statement that it required more color to get the shade desired in mortar on account of the lime. That is a subject that I do not pretend to know anything about at all, but if the other fact will help you I am glad to give it, that it requires about sixty pounds of coloring to every two barrels of mortar.

Further discussion of the subject was on motion postponed until Mr. Sherer could be present.

SECRETARY C. C. BROWN:—The next paper was prepared by Prof. Allen of the University of Michigan. He kindly consented to give us his experience in the testing of blocks and his ideas on the subject. He was unable to come himself and has sent his paper to be read.

The paper on "The Testing of Concrete Blocks" will be found on page 16.

The discussion followed:

MR. RICHARD L. HUMPHREY:—I would like to ask whether he gives the percentage of water in these tables?

SECRETARY:—He does not.

MR. HUMPHREY:—It is an important thing, in reporting the results of tests of concrete, to state the percentages of water used in the mixture, and also whether the aggregate, that is the stone and gravel, was previously wetted before mixing. If the stone or gravel has high-absorbing qualities, and if very little water is used a dry mixture is obtained. As it is impossible to tamp a dry mixture properly, a less dense and more porous concrete is the result which materially lowers the compressive strength of the concrete and increases the permeability. Experience has shown that a hollow concrete block, made of a dry mixture, is materially lower in compressive strength and much more porous than one made of a wet mixture. The number of tests that have been made on blocks is not extensive, and I give this statement as the result of my own experience in tests of this kind. Another important feature is the use of gravel in concrete. All things considered a good gravel makes a far better concrete than crushed stone. The particles being round compact more readily and the graduation in size of particles is much better than in the case of crushed stone. The resulting concrete is much stronger, being denser and therefore less pervious. There have been a number of papers written on the subject of concrete, showing as high as 15 per cent of loam may be contained in a gravel or crushed stone and produce most excellent results. This term "loam" is a misnomer, as "loam," properly so-called, is a vegetable matter having a highly injurious effect on the strength, while the loam thus referred to is a finely divided material of an inorganic character, and is generally very fine subdivisions of the aggregate. The more appropriate term for material of this kind is "silt." Oftentimes this silt is in the nature of finely divided clay. If this clay is of a granular nature, up to ten per cent. can be contained in gravel without weakening the strength, indeed, it often adds materially to the strength of the concrete in which it is used. If, however, the clay is of a flaky character it generally has a weakening effect on the concrete. The reason that the finely divided material (silt) has a weakening effect on concrete is that it enters into the pores of the aggregate thereby preventing the cement from flowing in, and weakening the bond and the concrete to that extent, for it is generally accepted that the bond or adhesion in concrete is produced by the cement in its fluid state being forced into pores on the surface of the particles of sand, gravel or stone and, in setting or crystallizing, forming the anchorage which binds the material together, so that if an excess of very fine particles are present they fill these void spaces, preventing the cement from going in, and thereby destroying the bond to that extent. A reasonable amount of finely divided material increases the strength of the concrete in that it fills the voids of the smaller particles and reduces the percentage of the cement required to fill them. Another reason why dry mixtures should not be used is that the cement often is deprived of sufficient water to enable it to set, the term "setting" being the chemical reaction which takes place when water is added, and from which the crystalline compounds of cement are formed, and the reaction of setting ceases when the material is deprived of water.

——————:-- I would like to ask if the fineness of the material applies as well to limestone as well as the other things mentioned?

MR. HUMPHREY:—It does not matter materially what the material is, whether it be crushed limestone, granite or trap rock that is used. You can have too rich a mortar. The quantity of cement that is required to bind the concrete together is that which is necessary to cover each particle with cement, and the principle is similar to that of sticking together two pieces of wood with glue,—if you have too much glue you do not have as good a bond as you would get if you had just sufficient glue to cover contact of the pieces to be bound together. When we understand more clearly the function of cement in mortars and concretes we will get to use them more economically than we do today.

——————:---I should just like to ask what the effect of fire would be on concrete made of limestone?

MR. HUMPHREY:—I do not wish to monopolize the time of this convention, but the question of the effect of fire on a limestone concrete is an important one. The question of the damage which is done to a limestone concrete by fire depends largely upon the intensity and the duration of the fire. In laying concrete it is the practice of nearly every one to keep the stones away from the surface, and there is, or should be, over each particle of stone a coating of sand and cement, which to a certain extent protects the stone from the effect of fire. The carbonic acid gas cannot be driven off readily from stone which is thus encased. Where the stone is exposed, however, the fire comes in direct contact and the carbonic acid gas is driven off. If the fire is of slight duration the stone is affected only to a slight degree. If, however, the fire continues for a considerable length of time, the carbonic acid gas is driven off to an increasing depth in the stone until it is completely decarbonated and, upon application of water to the surface, the stone hydrates and the structure falls to pieces, but as the intensity of the fire is generally not sufficient to drive off the carbonic acid gas to any depth, the danger from the use of limestone concrete is nothing like as great as is generally supposed.

WILLIAM SEAFERT:—We had a good example of this the other day in Chicago. A block fell off of the Courthouse and knocked two or three men in the head. I do not think there is enough importance paid to the tensile strength or cross breaking strength of concrete block. This strength of concrete is often ignored and only the reinforcement is taken into account and the compressive strength is all that is figured. This was done in very important work in Cleveland recently. A large building entirely concrete had girders of considerable length and they did not test the tensile strength at all. I make these remarks, for I think they have been overlooking something that is very important, namely the testing of the block for the tensile strength. We have already had girders sixty-one feet in length. A girder is subject to compression in the upper part and subject to tension in the lower part. They are often provided with steel in a great many places. While it might be well in the girders to figure the tensile strength of concrete it is so small that it does not add materially to the strength of the girder and it often falls by compression before the steel fails.

T. D. SHAWELL, Sebring, Ohio:—As I understand it, block makers want to get the tough blocks. I represent the Artificial Stone Company of Eastern Ohio, and last fall when none of the members of the Company were present, went to a factory and got what they call dregs. This has been all through the kiln and has had everything burned out of it that fire can burn. We got this and mixed it in four or five blocks, one-third of this and two-thirds of sand and gravel. We have no testing machine and we took an ordinary sledge and it took more pounding than any of the other blocks. It was four times the strength of any of the other blocks we made.

MR. HUMPHREY:—Did it have any effect on the color of the block?

T. D. SHAWELL:—This material was something the color of firebrick, and it showed little gray particles in it; it showed a lighter color, but that could be overcome by color. I am testing some block made of the sort sent me from Columbia University, of washed ashes two parts; sand two parts; and one part cement. The block stood 22850 in the paper that Mr. Brown has just read In our block washed and screened it stood 63700, and the other 80800. These were two parts ashes and two parts sand and one of cement 8x8x20 inches long. We used about eighteen per cent of water to the block.

————:---Did you use fine or coarse ashes?

T. D. SHAWELL:—Fine ashes, washed out of course. Prof. Woolson of Columbia University tried a freezing test. He first washes them thoroughly, and then puts then in water until they will not absorb any more water and then freezes them and puts them in luke warm water. He reports that he likes this test.

MR. HUMPHREY:—The general use of cinders, or the ashes from bituminous coal, in concrete is a vicious one, which should be discouraged. For filling, in the floors of office buildings, where a light concrete is very desirable in order to reduce the floor loads, it is perhaps permissible to use a cinder concrete, provided the cinder be of first-class quality, that is it should be comparatively free from unburnt coal and by all means free from sulphur in the shape of sulphides and from any considerable amount of ash. This is almost impossible to obtain as the average cinder contains upwards of 5 per cent. of unburnt coal with varying percentage of sulphide.

Such a concrete requires considerable more cement than a stone concrete would require, which adds to its cost, and in addition to that its compressive strength is about half of a very poor stone concrete, and the modulus of elasticity of such a concrete is only about three hundred thousand, where a good stone concrete would have from a million and a half up to three millions. There seems to be a fallacious idea that it is immaterial what the aggregate of concrete may be; if the cement has strength, the resultant concrete will be strong. Cement cannot increase the strength of the material which it binds together. If this material be weak, the resulting concrete will be correspondingly weak. Another serious objection to cinders is the difficulty of getting them uniform. It requires constant inspection to prevent very inferior material entering in, and for this reason it does not seem wise to use a material which requires such excessively close inspection, and the use of cinders, excepting for the peculiar conditions just cited, should be generally discouraged.

JOHN DRISCOLL, Appleton, Wisconsin:—I would like to ask the effect of ground lime?

MR. HUMPHREY:—The use of ground lime in mortar or concrete is not nearly as satisfactory as slaked lime. The judicious use of slaked lime, in small quantities, produces a much denser and less pervious concrete than can be obtained otherwise. The concrete in which the slaked lime is used can be tamped much more readily, and in mortars there results a condition which is called by masons "buttery." It is, however, essential that the lime should be thoroughly slaked. If there is any unslaked lime, the slaking of this after the cement has set will have a tendency to disrupt the bond.

The convention then adjourned until 8 o'clock.

TUESDAY EVENING, JANUARY 17.

CHAIRMAN GIVEN:—The first thing on the program this evening is a paper by A. L. Goetzmann, of Chicago, on "The Mixture of Concrete."

This paper will be found on page 19.

The discussion proceeded as follows:

—— ———:---I should like to hear from the gentleman from Ohio who spoke this afternoon, on hydrated lime in blocks. I should like to say here that I think he is directly opposed to the ideas that I have. If my views are wrong I should like to have them stricken out, for I do not want anything to go out from this Convention that is wrong.

MR. ROESS:—I am not the gentleman from Ohio, but I did say that I added hydrated lime, and that in all of my experience with it I have never had any trouble with it, but I should just like for someone to tell me what future trouble I am likely to get into. As far as my tests show personally, they show that I really have a stronger constitution by adding a little lime than I do without. I use gravel and coarse sand, and I have tried washing it. I have just used the natural gravel, but I have never had very good results from washing it. I have washed out ten per cent. of what seemed to be clay. I sometimes think it is only the finer sand, and so I have given up washing it when the sand looks clean. I have added about ten to fifteen per cent. of hydrated lime to the Portland Cement for a concrete mixture of 4 to 1. I have probably 50 tests.

—————:---I should like to say a word in regard to hydrated lime.

When we were about to enter into the manufacture of blocks we consulted a cement man as to what kind of cement to use. We were in the stone business, and we used our screenings of stone dust in the manufacture of blocks. In asking him about the cement blocks he volunteered the information that he said had come to him from an experience of several years in the block business. He said that they had trouble in getting blocks that were impervious to water. He put in about forty pounds of lime to the barrel, and found that gave a block which was impervious to water, and that it added to the strength and made a difference in the appearance of the block so that he succeeded in accomplishing what they were after. They told me that since that time they had been using lime and that they had no bad results. This is the experience of those who have handled the lime and they tell me that this has covered a number of years.

I should like to ask of the gentleman who read the paper what he means by fine stone, whether from one-fourth inch mesh up to one-half, or what, and also what he means by fine sand. In some sections fine stone is what in other sections might be called sand.

MR. GOETZMANN:—I believe when I spoke of fine stone I spoke of granite or marble or something for the facing of the block, and in this connection you have to take into consideration the kind of face. We would not use anything that would not pass through a half inch sieve.

—————:—What do these different people mean by fine sand, etc?

MR. GOETZMANN:—My opinion is that they mean by a fine sand what will pass through a 36 to 40 mesh screen, or something perhaps a little bit coarser than the lake sand that we find in the neighborhood of Chicago. Some of these lake sands are quite coarse, but most of them are quite fine, about 40 mesh.

MR. SEAFERT:—We have a sand procured from the lake by the process of suction that brings up a very fine sand washed very clean, but it is considered almost too fine in a general way to be used by itself and it does not give much body to the block. I should presume that some of that sand would pass through a very fine sieve. It is used by the plasterers in a general way, especially in making a putty coat. Along the lake shore the action of the water throws up different grades of sand. I should not recommend the use of the fine sand. The sand that would pass through a twenty-five to thirty mesh sieve would be all right, if some other heavy material were used with it.

G. T. FULTON, Hartford City, Indiana:—The question that I would like to have discussed is whether or not it is proper to use sand that has vegetable mold in it, or loam, perhaps I should say. This loam has more or less organic matter in it, but is mainly made up of clay. For the last two or three years at the laboratory in the University of Ohio, we have experimented with loam and clay, and we have found what the results would be. Out of some thirteen or fourteen thousand briquettes that have been made, the results have been that cement and sand mixed in the proportion of one to three, with from one to fifteen per cent. of loam as percentage of sand, has been stronger and given better results. I do not want to publish this as an established fact. We might go out and shovel mud into the concrete, but this has been the result of fourteen or fifteen thousand briquette tests that have been made for between three and four seasons.

Some of these briquettes have been exposed to the weather, freezing, thawing, hot and cold, and they have stood the test under those conditions. The point to this is that if eight to ten or fifteen per cent. of loam or clay can be added to your sand or can be found in your sand and give good results it is all the better. The results show from ten to thirty per cent increased strength from these percentages. The question of weather is yet to be decided upon, and the results are not sufficient to base the statement that you should shovel mud into your concrete. I would not care to be quoted in this manner. I shall take two or three more seasons to prove the economy of the work. There are some things which seem to speak in favor of loam in sand. Some special freezing tests were made outside of the ordinary weather tests by simply taking the refrigerator and freezing them. Another thing was determined, that the addition of ten or fifteen per cent of loam required longer time setting before they can be submerged in water, 48 hours rather than 24 which is ordinarily used in laboratory practice, so that the conclusion of the series of tests was that for a certain condition it was advisable not to have any loam and have clay, sand and gravel, but for a great many cases and conditions that have been met in the concrete practice of bridge work, foundation work, and house building, and girder work, it is perfectly safe on the outside work to use sand and gravel that might have from ten to fifteen per cent of loam. If you will take an average bank of sand or gravel you will find that not over ten but usually seven per cent is found.

W. F. BARROWS:—I would like to ask this gentleman whether I understood him to say that he used this mixture for the whole block or just the bacing?

MR. G. T. FULTON:—For the entire block. We should not face blocks, but make them the same all the way through. I want to say in keeping track of the cost of the construction of the block as compared with the price we can get for them, when anyone tries to save cement in building or making a concrete block he is making a mistake. If they can not get money enough for their blocks in the community in which they live and are operating to allow them to use enough cement, they had better stay out of the block business.

W. F. BARROWS:—I only asked that question becarse I have been making tests. I find that by using a medium fine lime stone that will pass from a 3-8 to 1-2 inch mesh,and mixing in the proportion of 1 to 6 it will be all right. I take the cement and dissolve it in water so that the concrete is much wetter than the other although the stone that passed through the 3-4 inch mesh would absorb a considerable percentage of the water; however, I find that stone made in that way gives much better results than the stone made of the average screenings not nearly so wet. I have never yet made a stone from lime stone screenings that was to my mind anywhere near so good as concrete made of cement, sand and gravel· I make what is called a two piece block. After filling the mold with the coarser stuff the top being struck off, I do not cut out any of the coarse concrete but simply sprinkle on the top of the mold sufficient powdered lime stone and cement to thoroughly cover and fill the voids and then put pressure on it. When we leave this off we are troubled with the wet, sticky appearance of the material.

——— ————:---May I ask the gentleman that read the paper what kind of lime stone he uses, the surface stone or the lower strata.

MR. GOETZMANN:—It is that obtained in Chicago at a depth of forty-five to one hundred and ten feet below the surface. We are compelled to put in the best of material to get a fine finished product. We have experimented with nearly forty different kinds of lime stone, and we have had different results, and I think the difference is caused by the difference in the lime stone. We first used a sandy lime stone which is not hard. The result was that when ground there was an immense amount of fine material. Take it to the mill and put it into concrete blocks in the same class of work we are using and we will not get the same result; in my opinion you will not get as good material as by using the sand. However, if you take that stone and screen it and use a certain proportion of sand with it and a large amount of lime stone with it, you get remarkably different results in the manufacture of the stone.

We have been speaking of clay in stone. I think that most of the clay is fine lime stone. Before we went into the business I was an engineer myself and made special tests of concrete work, and I have found that some of this so called clay is lime stone; at least ten per cent of it looks like clay. If that material is worked too much it has the appearance of marble. Of course we know that marble is lime stone, and I do not think there is any question but what it is good material. When we started our factory we were up against a very bad proposition. We had no available supply of lime stone so we were compelled to put in a crushing plant of our own, and that gave us an excellent opportunity to study the different lime stones, and I have found in ten different kinds there are only three that we have access to that are suitable to make stone of.

Now a word in regard to hydrated lime in stone. That is a question that has been given considerable study, and I would not like to have it dropped here where it seems that it is going to be dropped. The German manufacturers hydrate their lime and make a test in their factory and leave it six months before they touch it.

CHAIRMAN GIVEN:—The next on program is a paper by Mr. Richard L. Humphrey.

MR. HUMPHREY:—Mr. President and Members of the convention: I want to offer an apology for not having prepared a formal paper. My original intention was to present a few facts in connection with cement and its uses and thus open up the subject for discussion. I feel that for developing a good discussion an informal talk of this character is far better than a set paper. I found afterwards that I was supposed to take considerable time, and I have therefore gotten together a number of slides and will take up the subject of cement in a general way, touching upon the facts connected with its early origin and tracing the development up to the present time showing the process of manufacture and the many usages to which it is applied today, and I wish to state that I shall not touch on the subject of hollow blocks, as that has been pretty well treated and will be cared for by others who will follow me, and my remarks will therefore be confined to other lines than that of the hollow block. The Portland cement industry has shown a remarkable development, particularly so within the last few years. The increasing uses of Portland cement are so great that it is almost impossible to treat the subject in any other than a casual way in a talk of this character limited as it necessarily must be as to time.

Mr. Humphrey's notes of this paper were unfortunately lost and it can not be reproduced in this volume.

CHAIRMAN GIVEN:—We will have the report of the ocmmittee of ten.

MR. SWIFT:—Mr. Chairman: Your committee begs leave to report the following: The constitution and by-laws as amended by the Association will be found on page 5.

After some discussion the convention adjourned and voted to take up the constitution at 9:30 Wednesday morning.

WEDNESDAY MORNING SESSION, JANUARY 18.

The convention took up the consideration of the committee's report on constitution and by laws by sections.

Section I was adopted after considerable discussion.

Section II was amended making but one class of members and then adopted.

Sections III, IV, V, VI and VII were adopted, the treasurer's bond being changed to a surety company's bond, and salary provided for the treasurer.

The By-Laws were then adopted as read and the constitution and by-laws were adopted in their entirety.

The report of the committee on the nomination of officers was then taken up.

MR. SWIFT:—Your committee to whom was referred the nominating of the officers for the ensuing year, beg leave to report the following names:

For President, Mr. John P. Given, of Ohio.
For First Vice President, A. L. Goetzmann, of Chicago.
For Second Vice President, John H. Fellows, of Pennsylvania.
For Third Vice President, H. C. Quinn, of Georgia.
For Fourth Vice President, B. L. Simpson, of Missouri.

Your committee also recommend for the office of Secretary Charles C. Brown, of Indianapolis, and for the office of treasurer, A. S. J. Gammon, of Norfolk, Virginia.

In accordance with several requests from the floor each of the candidates named, excepting Mr. Quinn, who was not present, explained his connection with the use of cement and Mr. Simpson said:

MR. B. L. SIMPSON, of Missouri:—The fact that I was elected as Fourth Vice President is a surprise to me. I am an infant in the cement block business, as I have only been in it for ten months. As I have only been in this business for so short a time I should be glad to withdraw and have someone appointed in my stead who is in the reinforced concrete business.

F. K. HOGUE, Toledo, Ohio:—The gentleman who was placed before this convention has had ten months of business, and was modest enough to offer to decline in favor of some man who had had longer experience in the business, and especially a reinforced concrete man, and Mr. A. Monsted, of Milwaukee, has been suggested. I think it would be quite proper to accept this brother who has had much experience since the gentleman withdrew on account of the lack of experienc.

B. L. SIMPSON, of Kansas City, Missouri:—I second the motion.

(The motion was voted upon and carried.)

MR. WOLF:—I wish to move you that the rules be suspended and the secretary be instructed to cast the unanimous vote of this convention for the officers as reported by the committee to serve for the ensuing year, the changes being now a part of the committee's report as I take it.

J. W. WOOD, Parkersburg, West Virginia:—I second the motion.

After some discussion the motion was adopted and the convention adjourned.

WEDNESDAY AFTERNOON SESSION, JANUARY 18.

CHAIRMAN GIVEN:—It is now time for this convention to come to order.

SECRETARY BROWN:—Mr. Holmes of the United States Geological Survey has a matter to present to this association and I now have the pleasure of introducing to you Mr. Holmes.

MR. HOLMES:—Mr. President and Gentlemen of the Association: It strikes me as exceedingly fortunate that the gentlemen connected with the use of cement have come together for an organization of this kind. The trouble with this country has been on many occasions that a man did not know what his neighbor was doing or thinking about. It strikes me that people connected with an industry like this should be connected. As long as you are not there will be a constant friction,—a friction which grows out of prejudice and prejudice exists on account of ignorance, and you are doing the right thing today when you are thinking of getting together and forming an organization.

I am here today to tell you about the Geological Survey. We hope to be helpful and useful to the cement industry. Your industry was well represented in St. Louis . There have been a number of cement tests initiated from time to time during the past few years at different places and connected with different institutions over this country. Your work is not very different from ours; the methods of procedure are different, but the materials are the same. What I have to tell you I wish to tell you briefly. All the cement tests can be put together under one head with uniform methods and under uniform conditions so that the results can be summed up in a way in which they could not with different methods. There are many different cements manufactured by different cement concerns, for different purposes, and to be used under different conditions. I want to tell you that we want to co-operate not only with the cement manufacturers but with the cement users in making certain articles, and testing along certain methods and plans. When we adopt a certain method of testing of cement blocks we must find out by our method of investigation the basis which underlies the adoption of it with relation to the other improvements. We must work in harmony to bring about definite results which will be helpful to cement users as a rule.

CHAIRMAN GIVEN:—Mr. Humphrey has something to say along this line, and we will be pleased to hear from him at this time.

MR. HUMPHREY:—I think it is essential that these tests that the gentleman has just spoken of, should go on. We are ready it seems to me from the interest taken in this meeting and the discussion of the papers, for just such information as would be gathered from the operation of these testing laboratories.

I hardly think that in view of the enormous amount of business which this association must transact before it adjourns that it is wise to take more time at this time in placing before this meeting the advantages of this laboratory work, but I should like to have the association endorse this work before it adjourns. I should like to offer the following resolutions for your consideration:

In view of the rapid development of the American Cement industry during the past few years, including the increasing uses of cement in all architectural and other public works, the lack of reliable information as to the best methods of using cement in its relations to other structural materials, and the lack of accurate data as to the strength and durability of such products; and

In view of the enormous interests involved in the proper or improper uses of such materials in national, municipal and private works in all parts of the country, and the importance of having these investigations conducted under uniform methods. with the best possible equipment, independent of all local conditions, The National Association of Cement Users, in convention at Indianapolis, urgently petition congress to make adequate appropriations for the immediate continuation, on a larger scale, of such tests of structural materials, by the National Geological Survey.

The resolutions were adopted.

SECRETARY BROWN:—With the permission of the Association I will change the program. Mr. Albert Gridley will be obliged to leave this evening and we have decided to have his paper this afternoon. His subject is "The Practical Work of Constructing Sidewalks.".

The paper will be found on page 26.

The following were among the points made in the discussion:

L. F. PERDUE, Terre Haute, Indiana:—I should like to ask what his purpose is in excavating eleven inches. Is that intended for all kinds of soil or some special kind of soil?

MR. GRIDLEY:—You will find that I have said in this paper that some grades can be made of natural soil, and sometimes it requires gravel and sand; For instance, along White River there are many places where you will not need any thing under the concrete at all, and elsewhere there will be water seeping out most of the time and you must get it away and you must excavate deep enough to have something underneath that will do this and not leave it there to freeze and force up the work at the end and dip it down in the center.

L. F. PERDUE:—I would like to ask if that is on a spongy soil or clay soil. If you were on a soil that would hold water like a bucket and you put in eleven inches of space to hold water you will give it sufficient strength to force up the pavement when three inches would not do it.

MR. GRIDLEY:—If you cannot drain it in any other way you must use tile to do this. You must have drainage, no matter how you get it.

MR. PERDUE:—As a sidewalk maker I will give my experience. I live in a neighborhood where the land is composed of sand and gravel. When we are working under an engineer he makes us excavate twelve inches, and when we are not, we excavate only three or four inches. They require us to put in three or four inches of cinders but we find that our pavement lasts just as well. The last one we worked on we were compelled to excavate twelve inches and put in seven inches of cinders and five inches of concrete. As usual I protested. The soil is a mucky sort of a clay soil and will hold water like a bucket. If you should pour water into it it will remain until it evaporates before it disappears. As I say under protest I made the excavation and put in the cinders. For fifty feet the curb ran back seven feet wide. With this we had no trouble but in other places where the water froze under the sidewalk the people had to walk in the middle of the street.

The walks we put in our own way have been there six, seven and eight years and they are quite good yet.

As I have said to you, when I am not required to work under specifications I am sure my sidewalks will hold out, but when we have to put them in under an engineer they sometimes break.

I should like to know what causes expansion to break the sidewalks?

MR. GRIDLEY:—I do not know exactly what you mean. So far as concrete is concerned we know that we have expansion about the same as a good grade of steel, and there must be some allowance for it. You can make it in various ways. It has been made by putting in blocks of wood, and it has been made by allowing a space to remain open. The cause of this, so far as my experience goes is often due to the part of the work that is thought the least about, the concrete in the sidewalk. Some is caused by poor material, but perhaps one of the principal causes is water getting under the sidewalk. The water will force under and lift the edges up and of course it will go down in the middle.. That is the reason we want to get the water away from it as quickly as possible.

MR. PERDUE:—The question I asked was why the top of the pavement expanded and pushed up one joint over another. I say this is caused by your method of cutting the sidewalk. I would not cut the underpart clear through, but would only cut about one-fourth of an inch. The theory of a great many men is that we cannot leave it without being cut clear through, and then when it expands of course something will have to give way and it will pile up. When the men stop working at noon or night, or for an hour or so, the portion which they leave gets dry and hard and if the man who is doing this work takes his trowel and cuts that down he can unite the work so that there will be a beveled edge. Out of seven upheavals six are from this cause and not from the material at all.

MR. GRIDLEY:—How do you account for the cracking of the sidewalk for fifty or sixty feet?

MR. PERDUE:—I think that the inspector was not around when the walk was made. When the inspector is not around the men hustle up too much sometimes.

————:—Have you ever noticed that these cracks run back to a telephone, telegraph or trolley pole almost every time? I suppose it is due to the shock received from the pole. This will happen every time if the cement is put clear up to the pole.

MR. PERDUE:—You will find the same at the corner of a brick building. I never run the cement clear up; I always leave a space.

JOHN J. GRANDVILLE, Saginaw, Michigan:—It seems to me that the principal cause of the upheaval of your sidewalks is on account of your drainage not being properly taken care of. We in Michigan take acre of this part of the work by seeing that we have our soil well drained, and we are now almost free from these upheavals.

C. H. DANIELS, Anderson, Indiana:—I should like to ask if anyone has had any experience with sidewalks exploding after they have been down a number of years, and if so, what is the cause of it?

GEORGE L. STANLEY, Ashtabula, Ohio:—I have had sidewalks do the like and I think of course that it is due to expansion. Mr. Gridley told us to cut clear through with the trowel so that we would have a clear open cut, but that is the way we do all our work, and still these things happen.

GEORGE H. CARLIN, Oscaloosa, Iowa:—I have had sidewalks expand in the summer time and back up for four or five feet. I think this is caused by putting the blocks too close together and now we put in a three-fourths inch board about every hundred feet and after the sidewalk dries take it out. When this board is taken out we fill the space with sand.

C. P. WIDDICOMBE, Columbus, Ohio:—I would like to ask about making the sidewalks so smooth that people cannot walk.

MR. GRIDLEY:—If sidewalks are made smooth people are very likely to slip on them. I have a man working under me who refuses to leave them in this condition, and after we have finished he takes a brush and goes over them and this relieves the situation. Our engineer is also very careful about the amount of cement he puts in the top coat so as to avoid getting that glassy surface. This surface is due to an extraordinary amount of cement next to the surface. There is no doubt about this.

Concerning expansion, newly made cement will expand much more than cement that has been made for months.

R. CROMER:—The paper said that almost all cements were good cements. Now in many years of experience in the manufacturing business I have found that there is a vast difference in the cements manufactured in this country and in Europe; I have found that there is a great difference in quality in the cements sold as Portland cements. I have used fifteen or twenty different kinds.

I have put down sidewalks in clay soil without digging out a trench, without putting down gravel or cinders, or anything else, because under certain conditions I can get drainage, and the sidewalks that I have put down in this way have not frozen or broken up. In some places you have natural drainage to keep the sidewalks right and proper.

Mr. G. B. Kirwan, St. Louis, read a paper on "Water proofing of Concrete Blocks," which will be found on page 30.

A paper on "Waterproofing Concrete Structures" by W. H. Finley, of Chicago, was read by the secretary in the absence of the author. It will be found on page 35.

The short discussion of these two papers brought out the fact of the use of alum and soap solutions in waterproofing walls under the observation of N. F. Palmer of Brooklyn and I. L. Shaw, of Gibson, Ill.

THURSDAY MORNING SESSION JAN. 19.

CHAIRMAN GIVEN:—I know that you will all be pleased when I say to you that the Executive Board has elected Mr. Chas. C. Brown, Municipal Engineer, Secretary of the Association.

We have further selected as Treasurer for this Association Mr. A. S. J. Gammon, of Norfolk, Virginia, a gentleman of excellent character, and I know you will all be pelased with his selection.

I would like to ask that the First Vice-President of this Association come forward and take the chair as I have a few remarks to make.

Mr. Goetzmann came forward and took the chair.

MR. GIVEN:—Mr. Chairman and Gentlemen of this Convention.

I know that I voice the sentiments of every man upon this floor when I say that we are all proud of this Association so far. We have made great strides and the proceedings have been eminently satisfactory I think to the majority of us.

You gentlemen have honored me with selecting me as your temporary chairman, a compliment which I assure you I appreciate, and you have also further honored me with the selection of me as your permanent President, an honor which I also highly appreciate; and, I want you all to feel that I appreciated it. It will be impossible for me to express to you my sincere thanks for all these good things you have showered upon me. I have been honored as much as any man could be honored, and more than I deserve.

In looking over the Constitution and By-Laws which have been adopted by this Association, I find that officers shall enter upon the duties of their respective positions as soon as the business at the annual meeting at which they are elected is finished.

The business of this assembly will be finished at the close of the last session. And I have a proposition to make and a suggestion, if you please, that at the close of this session you will elect some gentleman in our midst whom I should like to recommend as President for the ensuing year so it will not be required of me to hold during this session and the session of the coming meeting.

Honors are appreciated by all intelligent men and I believe that it is wise, gentlemen, to pass these honors around, and specially to those who are competent and who are worthy of the honors.

We have in our midst a gentleman whom I know you will be proud to honor; a man who is prominent in all work connected with the cement industry; a man who is not allied; a man who is independent absolutely; a man of ability; and a man who will add credit and honor to this institution. If you will permit me as retiring president of this association to name this gentleman I will consider it a farther kindness. The gentleman to whom I refer is Mr. Richard L. Humphrey to whom you have all listened with pleasure and every man who has sat under the sound of his voice has been benefited by his being here among us. I thank you gentlemen for all the kindness and the honor you have bestowed upon me and ask that you consider my proposition.

—— ———:---I second that motion, Mr. President. Mr. Humphrey is one of the most eminent men in the United States, and he has a reputation not only in this country but in Europe.

He has built up and systematized the work of the cement manufacturers association in the United States when he was in charge of the laboratory. He has since that been in charge of the laboratory of the Cement Manufacturers' Association at St. Louis, and I do not think we can be honored by any man more than Mr. Humphrey as president of this association.

—— ———:---Mr. Chairman: I understood that we had elected Mr. Given as the president for the ensuing year. I have no objections to Mr. Humphrey in the world and will gladly vote for him in the proper time. I want to say there is no vacancy yet. Mr. Given has not resigned and correctly to do this we must have a vacancy before we can elect Mr. Humphrey. If Mr. Given had resigned I would make a motion at once that it be accepted, and then a motion would be in order to elect Mr. Humphrey But, we first want to vacate the office.

MR. WATSON:—Mr. Chairman: I move you that the motion of Mr. Given be accepted.

MR. GIVEN:—Mr. Chairman, I do not wish to be understood by this association as resigning. I wish it to be understood by this association that I would like to honor this gentleman and that I would like simply to retire as the first president of this association. Mr. Humphrey would then be the second president of this association.

Gentlemen, you certainly understand the situation. If I proceed to hold over then I must hold over the next year of this organization. There is no reason why this should be the case when we have so many intelligent men who are members of this association and who can by their skill and by their ability serve you better, infinitely better than I can myself, and I hope you will consider this matter; gentlemen, consider it seriously. It is my earnest desire that you do this for me.

MR. FORTUNE:—I beg leave to say a few words. Mr. Given has showed by this action here this morning a breadth of mind and magnanimity of spirit that I should think would challenge the admiration of all here who have the interests of this organization at heart.

He is the president of this organization, elected by an overwhelming vote in recognition of his abilities and the services he has rendered in bringing this organization together.

If it is his wish to retire, as he states, for the purpose of passing the honor to another man so that he will not serve through two sessions of this organization instead of through one, an honor that would not fall to any succeeding president, let us honor him in this way. When Mr. Given comes before us with this great proposition on his part I feel as one that it is a favor, a very large-minded and very generous thing on his part to do, and that we, if we are disposed to accede to his wishes and accept another man as president, should do it in the same spirit that Mr. Given himself has placed before us. It is not a question of resignation. Mr. Given has not offered his resignation, as I understand it, but he would retire as president of this organization, honoring another man who has been mentioned in this connection with this position —the only man whose name has been brought forward on this floor.

It is, gentlemen, as I say, a most magnanimous thing to do and it shows that Mr. Given has the welfare of the organization at heart, which he has helped to start. If it is our wish to permit this change to be made let us do it with as much credit to ourselves as Mr. Given showed in making the offer.

I move you therefore Mr. President—and I have no doubt that it is merely a matter of method, or rather second the motion of Mr. Given, the one before the house, and the one which will be first acted upon now, that Mr. Humphrey be elected as his successor to serve during the ensuing year.

MR. WATSON:—I rise to a point of order, Mr. Chairman. The motion is out of order—the motion just made by this gentleman over here—that motion is out of order.

It seems that Mr. Given does not understand my motion. It was not that Mr. Given resign as president of this association until after the close of this meeting. My understanding is that we elected Mr. Given as president of this association for the ensuing year. After this meeting is closed, if the minutes are correct, they will show that we did elect him for the ensuing year and there is no vacancy for the ensuing year unless Mr. Given resigns, but he does not resign until after the termination of this year as president of, it, that's all. Therefore I say to you, we cannot elect a president for the ensuing year until this meeting is over unless Mr. Given resigns. Otherwise, we might elect Mr. Humphrey and have two presidents and the minutes will show that he was elected for the ensuing year.

Mr. Given, as Mr. Fortune has said, has made a most magnanimous offer and let us see if we cannot properly understand the situation. It is clearly this. Mr. Given, in that magnanimous Ohio style of his, proposes not to resign but to retire, not in advance of the hour and day of his election but at the close of this convention and to allow a permanent president to be elected for the ensuing year. I think that is the purpose of the plan and the one in Mr. Given's mind. I have not seen anywhere in my fifty odd years of life a greater offer than this. I desire, therefore, to make this motion, that the offer and proffer of retirement of Mr. Given as president at the close of this convention that another may be elected for the following year be accepted.

W. J. SCOUTT:—The Articles of Incorporation and the By-Laws of this organization certainly provide for the method of filling vacancies that may occur among the officers of the Board of Directors of this Association. If the president, Mr. Given, should resign his position as president of this association, then as is usual in almost all, if not all organizations, that office must be filled by election by the Board of Directors and not by the association itself as such.

Today, and until the close of this meeting, Mr. Given is our honored president. At the close of this meeting should he retire from the presidency to which we have unanimously elected him, the office is vacant, and it must be filled by the Board of Directors. While this body is still in session, should our president tender his resignation he will by that act retire from the presidency of the association in due form. While the convention is still in session it can then by suspending the rules governing the election of an officer in case of vacancy proceed to elect another president to succeed our present president whose duty it will be during the entire ensuing year, as well as at the following sessions of this association to perform all the duties of president of the association.

I presume there will be a meeting of the Board of Directors during the ensuing year. If there be such a meeting, that meeting or those meetings, must be presided over first by the president, and in case of his absence or disability by a vice president. Should we accept the offer of our president to resign or rather elect a successor in his stead that man would be the proper person to preside over the meetings of the Board of Directors for the entire ensuing year. I am certain that I am right and any other procedure would simply ball up the records of the officers and the proceedings of the association.

CHAIRMAN GOETZMANN:—Can the chair say two or three words? It is my impression that you have a misunderstanding of the position which Mr. Given takes, that is, that he retire at the end of this session and that his successor should take the office at that time acting wholly as president. Mr. Given is out. The new president acts as president from the end of this session to the end of the next session when the second successor comes in.

MR. WOLF:—If I am properly informed, there is only one thing that this organization can do and do it right according to parliamentary laws. The gentleman who spoke just before me is right, and unless we proceed to do as he suggests there is only one thing that this convention can do.

We have adopted our constitution and by-laws and, without amending them, there is only one thing that we can do, and that is to unanimously today terminate the first term of the first president of this association at the close of this session and that can only be done by the unanimous consent of every member of this organization present at the time ; otherwise, it would have to be done by amending the by-laws or constitution, either or both, in the proper way as provided therein.

Now I wish to say that I certainly would object and prevent unanimous action at this time and at this session. It seems to me too much like forcing a man from office. It has been said that some men achieve greatness and that others have it thrust upon them, and that others are born in Ohio. Now I wish to say that it looks very much to me as though there may be an attempt to detract from the greatness that some men have achieved, and while the spirit of our president is great, and while we can say nothing in that respect, yet I think there are others whose spirit of magnanimity should show forth at this time.

We have an organization. We have elected our officers. Let us allow the proceedings of this convention to close and then if we have any officials who wish to retire from office let it be done in the regular way. There is no necessity of electing two presidents. We have here over five hundred who have registered. They have not become members of this association, as I understand it. They have not paid dues, and when this five or six hundred go home the secretary may receive dues from one or two hundred, but there may be many who forget to send along their five dollars. Should they proceed to run the association? Therefore, let us not try and find a method by which he may resign, and not try and find a method to upset that which we have accomplished. The work has been well done and let it stand until the end of the year.

I think we differ somewhat in means and meet in the end. We all recognize the great spirit of our president here and we all want to accede to his request. I would therefore make an amendment to Mr. Watson's motion that they accede to his request and at their first meeting elect Mr. Humphrey as president. Do I hear a second to this?

W. J. FEE:—I second the amendment.

CHAIRMAN GOETZMANN:—Now just a moment. You have heard the amendment and the second to the original motion Would you kindly repeat your motion?

MR. WATSON:—I accept the motion so it may be put in one.

CHAIRMAN GOETZMANN:—Are you ready for the question, gentlemen. Now, Mr. Watson, for the benefit of the chair, would you kindly repeat your motion, adding the amendment which, by your approval, is made a part of the original motion so that it may all be put at one time.

MR. WATSON:—The motion is this; that the Executive Committee,—if that is a proper term,—be requested by this Association to accept the generous offer of Mr. Given and that we refer the same to the Executive Committee with the request that they formally accept it at their first meeting after the final adjournment of this session, and that they elect as his successor Mr. Humphrey.

The motion was voted upon and unanimously carried.

CHAIRMAN GOETZMANN:—It is the unanimous verdict of this Association that the motion be adopted.

MR. GIVEN:—I would like to say further that in accepting this proposition that I have made, you have still heaped upon me honor and I appreciate and thank you all, and only wish that I might be able to shake hands with you, and thank you personally.

R. CROMER, Logansport, Ind.:—I am going to offer some amendments to the constitution to be adopted, My theory is that each one of the different sections of this industry should be represented. We own this organization and the majority of us come here for practical information that will be of use to us in this business. Probably sixty or seventy per cent. of us are workers in the use of cement. The manufacturers of cement, however, are a part of us. They produce the cement for our work. Others are a part of us because they produce the machinery to sell to us for our use, also the reinforcement as well as the sidewalk makers. My idea is to bring all together and be in such a shape that we may receive information from each section for our benefit. Therefore, my idea is this: That the by-laws be so amended that each one of those different parts of the industry shall be represented by a vice president, with two members associated with him as a chairman and associate chairman of the committee of three, spoken of in our rules. There may be a vice-president and two of the same industry with him, not two men belonging to the same manufacturing concern, but from different places. They are to devote their time and attention to that particular branch and have it in such shape as to give us the information that appertains to their branch.

The different sections shall get together and recommend a vice president to act for them in that branch, and that then a Board of Directors composed of the officers and vice presidents shall appoint two on each committee who are in the same line of business.

The amendments are as follows:

Amend Section 1 of Article III to make four general vice-presidents and a vice president from each of the Sections hereinafter provided for.

Amend Article III Section 7 so that the chairman of each committee shall be elected by the Section under its charge and recommended to the General Association for election as vice-president representing the Section.

I believe that now embraces the whole thing. The vice president being elected of course shall retain his position and each vice-president then shall be a member of the Board of Managers.

I move you, Mr. President, the adoption of these amendments if I can get a second.

—— ———:---I second that motion.

MR. FORTUNE:—I move we refer it to the Executive Committee for their careful consideration and let them report it to the Association at the next meeting.

MR. CROMER:—It has been suggested to me, and I believe it is a good suggestion, that the committee be increased from two to four, making five including the vice-president of each one, and I am willing to do this, that this matter and resolution of amendment be taken under consideration and be voted upon at the meeting this afternoon.

—— ———:---I second the revised motion.

The motion was voted on and carried.

A paper on "Cement Posts" by J. A. Mitchell was read. The paper is on page 39.

A paper on "Mortar Sand" by J. C. Hain, Engineer Masonry Construction of the Chicago, Milwaukee and St. Paul Railroad, was read by the secretary in absence of the author. The paper is on page 42.

CHAIRMAN GOETZMAN:—I wish to suggest, in order to expedite matters so that we will not be detained very long this afternoon, that the various sections of this Association get their people together and select from their number their choice for representation on the Executive Board.

The Association adjourned to meet at 2 p. m.

THURSDAY AFTERNOON SESSION, JAN. 19.

The convention was called to order at 2 p. m. President Given in the chair.

SECRETARY BROWN:—The executive board met this noon in accordance with the instructions of the convention this morning and have fixed the amendments to the constitution which were presented by motion this morning as follows which seem to be sufficient to make the constitution read correctly with the new ideas presented.

Article 2, Section III would be changed so that it would be necessary to have a majority of the members of the executive board to elect new members, which will make it:

"Nine affirmative votes shall elect an applicant to membership in the Society."

Article 3, Section I would be changed to read:

"The officers of the society shall consist of the president, four general vice-presidents, a vice-president for each of the sections into which the Association may be divided, as hereinafter provided in Section 7, an executive secretary and treasurer. These officers shall constitute the executive board, of which the president and executive secretary shall be ex-officio chairman and secretary respectively."

Article 3, Section VII, shall be changed so as to read:

"The Society shall be divided into the following sections, whose membership shall be determined by the enrollment of members of the assocition in such sections as they may choose; concrete blocks and cement products, monolithic concrete, streets, sidewalks and floors, reinforced concrete, art and architecture, cement manufacture and testing of cement and ecment products, machinery for cement users, fire proofing and insurance, laws and ordinances. The chairmen of these sections shall be elected by the sections at the first section meeting provided on the program of the annual convention and shall be reported to the Association for election as vice presidents of the Association as provided in Sections 1 and 2.

Standing committees of four additional members each shall be appointed by the respective chairmen and the president of the association to aid the chairmen in their work. The following standing committees of three members each shall be appointed by the president at or immediately following the annual meeting."

On motion the amendments were unanimously adopted as read.

MR. FAIRLEIGH:—In the meeting this morning under the section of Manufacturing of Cement and Testing of Cements, it was resolved to suggest to this meeting that the title be changed to read "Committee on Testing of Cements and Cement Products."

CHAIRMAN GIVENS:—Without any dissenting voice that change will be made.

JOHN H. FELLOWS:—I will give the name of B. L. Simpson for the section on Concrete Blocks and Cement Products.

MR. COMER:—We have elected a vice-president for the section of Streets, Sidewalks and Floors, and recommended W. W. Schouler of Newark, New Jersey.

——— —————:--- C. S. Hall of the Southern Roofing and Paving Company, of Louisville, Ky., is recommended for the section on Reinforced Concrete.

—— ————:---I take pleasure in nominating Charles E. Watson, Toronto, Can., for the section on Art and Architecture.

——— —————:—E. W. Boyer, of the Atlas Portland Cement Company is recommended for the section on Testing Cement and Cement Products.

The section on Machinery for Cement Users, selected W. W. Benson, of Washington, D. C., as its vice president. All these were duly elected vice presidents of the association.

MERRILL WATSON:—I have a motion to offer which I am quite sure will meet with the approval of the convention. I move you that before this association adjourn we tender a vote of thanks to the secretary, and instruct him to write a letter of thanks and appreciation to the Commercial Club of Indianapolis for their hospitality, and at the same time extend to citizens of Indianapolis our thanks for the generous hospitality of the city during this meeting.

(The motion was seconded, voted upon and carried unanimously.)

SECRETARY BROWN:—Several have already paid their fees for the year, and membership certificates will be prepared and forwarded to the members at the earliest possible date. The secretary will also send according to instructions from the Board a circular letter to all persons on the list stating that they are acceptable as members of the association and may become members upon the receipt of $5.00 when a membership card will be sent to them.

CHAIRMAN GIVEN:—I hope every man who is a member of this Association will appoint himself a committee of one to see that we can widen and broaden the circle of this Association. If we will take it upon ourselves to tell of the great advantages of becoming members of this Association there is no reason why each one of us should not secure two or three members. I am satisfied if we will pay a little attention to this we can gain large results from it.

Now the next thing for us to do is to select the place of meeting. Along this line I wish to extend the invitation of the Board of Trade of the city of Columbus and to say to you that they will furnish their auditorium, which is an excellent place for meetings of this character, and they will furnish you every entertainment that is on the regular bill and will furnish you some things that are not always on the regular bill. Mr. Bassell, secretary of the Columbus Board of Trade, asked me to say that they honestly and sincerely insist upon this meeting coming to Columbus. Regarding Columbus I will say this: It is certainly a very excellent place, has fine hotel accommodations, and almost every kind of entertainment and can easily take care of a meeting of this character. It is similar in that respect to Indianapolis and will be honored if this Association decides to hold its next meeting there. As an excuse for the secretary of the Board of Trade not being here I will say that I have just received a message from him in which he tells me he was detained on account of illness, and was very sorry that he could not meet with this association, and asks me to extend a cordial and hearty welcome to you if you deem it wise to select Columbus as the next meeting place of this association.

MR. WATROUS:—Mr. President, I first want to congratulate you on this great assemblage. Your attendance at this meeting has been remarkable. It is my pleasure to come to you from Milwaukee and ask you to hold your next convention there.

We stand as one of the leading cities in the development of cement uses, and our city is able to take care of this convention in the best possible manner. We have a very fine convention hall with eighty-seven thousand feet of floor space, and we have a large space for the exhibits. I carry with me an invitation from the Mayor of our city:

Milwaukee, Wisconsin, January 17th, 1905.

National Association of Cement Users,
In Convention, Indianapolis, Indiana.

Gentlemen:—I have the honor in the name of our beautiful city to herewith extend to your honorable Association a cordial invitation to hold your next convention in Milwaukee. Ours has become the most popular convention city in the country and our popularity in that respect is well deserved.

We shall take great pleasure in receiving you, and I am certain that you will be happily impressed with the superior facilities we can offer for your enjoyment and entertainment.

Respectfully yours,
(Signed) DAVID ROSE, Mayor.

WILLIAM SEAFERT:—I wish to name Chicago. We have a large city and we are interested in many lines of work. We have a tunnel forty feet under ground six feet wide and seven or eight feet high, and twenty-three miles long. The railway expended forty-eight millions of dollars and are going to expend fifty millions more. We have all sorts of concrete houses, and blocks, and many things of interst in regard to concrete construction, General Wheeler has said that the city will give one thousand dollars for the entertainment of this convention if it will come to Chicago, and if that is not enough we will give more. We will welcome you in every way possible. I therefore move you that the City of Chicago be the next meeting place of this Association.

E. S. HOTCHKISS:—I second the motion. We are about to have a new concrete hotel, and if this building does not even have a roof on it when you come you shall have it anyway. We will promise to have it ready for you when you get there.

MERRILL WATSON:—I promise you that this is positively my last appearance. I rise to second the motion in favor of Milwaukee.

MR. SHERER:—I wish to say that we have great facilities to accommodate conventions of this character. If you will come we will entertain you royally. There will be no doubt about that. We would like to have you come.

The vote was taken, and stood 20 for Columbus, 45 for Milwaukee, and 29 for Chicago.

CHAIRMAN GOETZMANN:—It is the sense of this convention expressed by a vote of 45 to 20 and 29 for Chicago and Columbus, that the next convention of this Society shall be in the City of Milwaukee.

E. S. HOTCHKISS:—I move you that we make it unanimous by a rising vote.

(A unanimous vote was taken.)

CHAIRMAN GOETZMANN:—It is rather unfortunate, gentlemen, that our retiring president as well as the incoming president were called out of the room and at the present time it devolves upon me, as first vice-president of your organization, to draw to a close this most interesting meeting. There is nothing further that can be said, and I believe that everybody has said all of which he is capable. I am sure I have, and that is a good deal for a machine man to say. I think before this convention adjourns we should extend a vote of thanks to our retiring president for the manner in which he has conducted the business of the Association, and if I may do so I should like to have it made unanimous.

(The vote was made unanimous.)

I declare the first annual meeting of the National Cement Users Association adjourned sine die.

REGISTRY OF THE CONVENTION.

Addresses in parenthesis have been found incorrect.

James F. Abbey, Cincinnati, O. American Concrete Construction Co.
H. F. Abbott, Jackson, Mich.
J. J. Abbott, 214 Century Bldg., Denver, Col. Cement Products Co.
H. Abrams, Norfolk, Va. Universal Concrete Machinery Co.
Adolph Adams, Kendallville, Indiana.
F. G. Ader, 6th and Saratoga Sts., Newport, Ky.
B. F. Affleck, 1063 The Rookery, Chicago. Ills. Steel Co., Cement Dept.
G. M. Albertson, Orleans, Indiana.
D. H. Allen, Miamisburg, Ohio.
E. Allen, Washington, Indiana.
E. D. Allen, Pendleton, Indiana. Clark Cement Co.
W. C. Allen, Indianapolis, Indiana.
Geo. E. Altman, Edinburg, Indiana.
American Bldg. Block Co., Indianapolis.
    J. R. O'Neil, Indianapolis.
American Hydraulic Stone Co., Denver, Colo.
    W. J. Scoutt, Chicago.
    H. D. Watson, Chicago.
American Concrete Construction Co., Cincinnati, Ohio.
    James F. Abbey, Cincinnati, Ohio.
Davis Amond, Newcastle, Indiana.
J. F. Angell, Columbus, Ohio. Winget Concrete Machine Co.
A. L. Armstrong, Eaton, Ohio.
Fritz Arnold, South Bend, Indiana. Ideal Concrete Machinery Co.
C. F. Asbury, Marshall, Indiana.
Fred Asp, (Chicago, Ills.)
Atlas Portland Cement Co., 30 Broad St., New York City.
    C. F. Berger, New York City.
    E. D. Boyer, Northampton, Pa.
    Paul A. Jandernal, New York City.
A. A. Atwater, Cleveland, Ohio. The Schatzinger Consolidated Realty Co.
S. E. Atwater, Cleveland, Ohio.
S. D. Austin, 414 Mathews Bldg., Milwaukee, Wis. Milwaukee Concrete Supply Co.
Automatic Bldg. Block Machine Co., Jackson, Mich.
    A. M. Haight, Jackson, Mich.
H. L. Avery, Akron, New York.
Harry A. Axtell, Bloomington, Indiana.
A. Bamberger, St. Louis, Mo. St. Louis Portland Cement Co.
W. A. Baden, Petersburg, Indiana.
E. Bader, Fresno, Cal. Worswick Paving Company.
Chas. K. Baird, Hamilton, Ohio.
J. A. Ball, Indianapolis, Ind. H. E. Goodwin & Co.
E. E. Banner, Sergent, Neb.
J. L. H. Barr, Batavia, Ohio.
Ed. W. Barrows, Indianapolis, Indiana.
W. F. Barrows, Indianapolis, Ind. Standard Cement Block and Construction Co.
C. H. Bathrick, Chicago, Ills. Municipal Engineering and Contracting Co.
W. H. Beazel, Indianapolis, Ind. Indianapolis Cement Products Co.
Geo. C. Bedell, Indianapolis, Indiana.

- H. F. Behrle, Milwaukee, Wis. National Bldg. Block Co.
- B. F. Bell, Newcastle, Indiana.
- Chas. A. Bell, Pittsboro, Indiana.
- Bellevue Stone Co., Bellevue, Ohio.
  - Sol. M. Wolf, Bellevue, Ohio.
  - T. E. Wyant, Bellevue, Ohio.
- Geo. Benedict, Nashville, Tenn.
- W. W. Benson, Washington, D. C. H. S. Palmer Co.
- W. H. Benton, Indianapolis, Indiana. Block Bridge and Culvert Co.
- C. F. Berger, New York City. Atlas Portland Cement Co.
- John Bernard, Burlington, Iowa. Cement Machinery Mfg. Co.
- Berthelet Construction Co., Milwaukee, Wis.
  - J. R. Berthelet, Milwaukee, Wis.
  - W. T. Berthelet, Milwaukee, Wis.
- J. R. Berthelet, Milwaukee, Wis. Berthelet Construction Co.
- W. T. Berthelet, Milwaukee, Wis. Berthelet Construction Co.
- Carl Beyer, Warsaw, Indiana.
- Wm. A. Bibler, Arlington, Ohio.
- H. D. Bickel, Buffton, Indiana.
- W. L. Bishop, Rochester, New York.
- W. M. Birch, Muncie, Indiana.
- A. C. Birnie, Springfield, Mass.
- John Blake, Wolcott, Indiana.
- Blakeslee Concrete Block and Machine Co., Columbus, Ohio.
  - C. C. Huston, Columbus, Ohio.
  - C. C. Shepard, Columbus, Ohio.
- Block Bridge and Culvert Co., Indianapolis, Indiana.
  - W. H. Benton, Indianapolis, Indiana.
  - H. F. Hackedorn, Indianapolis, Ind.
  - S. J. Rice, Indianapolis, Indiana.
  - Everett Wagner, Indianapolis, Indiana.
- Bloomer Bros. Co., Newark, N. J.
  - R. A. S. Bloomer, Newark, N. J.
- R. A. S. Bloomer, Newark, N. J. Bloomer Bros. Co.
- Wm. Bodley, (Louisville, Ky.)
- Louis E. Bogen, Cincinnati, Ohio.
- Edward Bogk, Milwaukee, Wis. Ricketson Mineral Paint Works.
- L. C. Bonnot, Canton, Ohio. The Bonnot Company.
- The Bonnot Company, Canton, Ohio.
  - L. C. Bonnot, Canton, Ohio.
- C. F. Born, Danville, Indiana.
- F. A. Borst, South Bend, Indiana. Ideal Concrete Machinery Co.
- R. H. Bowen, Keokuk, Iowa.
- A. F. Bowers, Rochester, Indiana. Miracle Pressed Stone Co.
- P. A. Bowsher, Terre Haute, Indiana.
- E. D. Boyer, Northampton, Pa. Atlas Portland Cement Co.
- L. P. Boyles, Chicago, Ills.
- A. T. Bradley, Rochester, N. Y. Century Cement Machine Co.
- A. E. Bradshaw, Indianapolis, Ind. Indianapolis Mortar and Fuel Co.
- Geo. Brady, Jackson, Miss.
- A. L. Broughton, Cleveland, Ohio. Standard Sand and Machine Co.
- A. C. Brown, (Indianapolis, Ind.)
- Chas. Carroll Brown, Indianapolis, Ind. Municipal Engineering Co.
- Bert Brown, Lagrange, Indiana.
- W. A. Bruce, Indianapolis, Ind. P. B. Miles Mfg. Co.
- Buckeye Portland Cement Co., Bellefontaine, Ohio.
  - Chas. F. O'Donnel, Bellefontaine, Ohio.
- Buffalo Litholite Co., Buffalo, New York.
  - Harry Evers, Buffalo, New York.
- Harold Burdge, Indianapolis, Ind. Indiana Gravel Co.
- Wm. Burford, Indianapolis, Indiana.

Rev. J. C. Burkhardt, Connersville, Indiana.
R. C. Burmood, (Chicago, Ills.)
Buser Concrete Construction Co., Mt. Morris, Ills.
J. M. Campbell, Columbus, Ohio.
C. H. Carlon, Oskaloosa, Iowa. Cement Machinery Mfg. Co.
Geo. H. Carlon, Oskaloosa, Iowa. Cement Machinery Mfg. Co.
Wm. P. Carmichael, Williamsport, Indiana.
Clarence Carney, Rushville, Ind. Cement Machinery Mfg. Co.
H. H. Carter, Syracuse, N. Y., E. W. Seamans Co.
W. H. Caskey, West Park, Ohio. Cleveland Car Co.
Castalia Portland Cement Co., Pittsburg, Pa.
    Chas. L. Johnson, Sandusky, Ohio.
C. L. Catherman, Elkhart, Indiana. Ideal Cement Post Co.
Cement and Engineering News, Chicago, Ill.
    Wm. Seafert, Chicago, Ills.
Cement Machinery Company, Jackson, Mich.
    C. A. Chamberlain, Jackson, Mich.
    M. J. Furnas, Jackson, Mich.
    John P. Given, Circleville, Ohio.
    Chas. Kuhlman, E. St. Louis, Ill.
    L. D. McClaflin, Jackson, Mich.
    L. P. Normandin, Jackson, Mich.
    Wm. Phillips, Columbus, Ohio.
    S. L. Wiltse, Jackson, Mich.
Cement Machinery Mfg. Co., Burlington, Iowa.
    C. H. Carlon,
    Geo. H. Carlon,
    M. S. Daniels,
    W. F. Roney,
    O. H. Phillips,
    J. W. Sanderson,
    E. B. Kelley,
    Geo. P. Schaawb,
    Clarence Carney,
    M. M. Moralee,
    B. L. Simpson,
    John Bernard,
    W. T. Berthelet,
    J. R. Berthelet,
    Peter Levandousky,
    Bloomer Bros.,
    W. E. Colladay,
    T. J. Reid.
Cement Products Company, Denver, Col.
    J. J. Abbott, Denver, Col.
Century Cement Machine Company, Rochester, New York.
    A. T. Bradley, Rochester, N. Y.
    A. Crandall, Rochester, N. Y.
    John N. Rauber, Rochester, N. Y.
    Ely Roberts, Rochester, N. Y.
    J. W. Shone, Rochester, N. Y.
    W. O. Williams, Rochester, N. Y.
C. A. Chamberlain, Jackson, Mich. Cement Machinery Co.
Fred R. Charles, Richmond, Indiana.
The Chase Foundry and Mfg. Co., Columbus, Ohio.
    C. P. Widdicombe, Columbus, Ohio.
W. H. Cheery, Rushville, Indiana.
Isaac Chew, Anderson, Indiana.
C. F. Childers, Indianapolis, Ind. H. S. Palmer Company.
Clark Cement Company, Pendleton, Indiana.
    E. D. Allen, Pendleton, Indiana.
    C. A. Clark, Pendleton, Indiana.
C. A. Clark, Pendleton, Indiana. Clark Cement Company.
I. A. Clarkson, Clarksburg, W. Va.
Daniel Cleary, Indianapolis.
Will J. Cleary, St. Joe, Mich.
Cleveland Car Company, West Park, Ohio.
    W. H. Caskey, West Park, Ohio.
    W. E. Ellenberger, Cleveland, Ohio.
J. G. Clough, Quincy, Ills.

W. E. Cobeau, Chicago, Ills. Wolverine Portland Cement Co.
S. M. Coe, Columbus, Ohio. Winget Concrete Machine Co.
W. E. Colladay, Decatur, Ills. Cement Machinery Mfg. Co.
M. J. Collins, 911 W. 27th St., Indianapolis, Ind.
Concrete Construction Co., Steubenville, Ohio.
  Chas. D. Floto, Steubenville, Ohio.
R. S. Conner, Grand Rapids, Mich. Newaygo Portland Cement Co.
Contractors Supply and Equipment Co., Chicago, Ills.
  E. B. Kelley, New York City.
  T. L. Smith, Milwaukee, Wis.
Chas. Cook, Mooresville, Indiana.
J. H. Cooley, 6322 Drexel Ave., Chicago, Ills.
Wm. Coon, Frankfort, Indiana.
J. W. Cooper, Minneapolis, Minn.
Cottom Artificial Stone and Mfg. Co., Dayton, Ohio.
  T. O. Eichelberger, Dayton, Ohio.
  J. W. Popenoe, Dayton, Ohio.
H. E. Cotton, Brownstown, Indiana.
O. W. Cotton, Shelbyville, Indiana.
W. J. Coyner, (Terre Haute, Indiana.)
A. Crandall, Rochester, New York. Century Cement Machine Co.
Col. R. Cromer, Logansport, Indiana.
S. W. Curtiss, Chicago, Ills. Garden City Sand Company.
J. M. Cutshall, Brazil, Indiana. Pettyjohn Brothers.
G. Cutter, Chicago, Ills.
H. Dakin, Elgin, Ills., H. Dakin & Company.
H. Dakin & Company, Elgin, Ills.
C. H. Daniels, Anderson, Indiana.
M. S. Daniels, New York City. The Kakiat Company.
F. B. Darmger, Newcastle, Indiana.
F. E. Davenport. (Chicago, Ills.)
Wm. R. Davis, Youngstown, Ohio.
Fred W. Day, Indianapolis, Ind. Indianapolis Cement Products Co.
Walter L. Day, Indianapolis, Ind. Indianapolis Cement Products Co.
C. H. Defrees, South Bend, Indiana.
J. E. Dennis, (Buffalo, New York.)
Dever Cement Tank and Silo Co., Cassopolis, Mich.
  O. A. Dever, Cassopolis, Mich.
  Geo. M. Rivers, Cassopolis, Mich.
O A. Dever, Cassopolis, Mich. Dever Cement Tank and Silo Co.
John Devere, Kankakee, Ills.
Chas. DeWitt, Michigan City, Indiana.
Wm. Dickinson, Chicago, Ills. Marquette Portland Cement Co.
Phillip Dieffenacher, Massillon, Ohio.
C. W. Diener, Burlington, Wis.
Samuel Dingle, Newcastle, Indiana.
J. A. Doe, Omaha, Neb.
M. Joseph Downes, Lebanon, Indiana.
B. F. Drischel, Richmond, Indiana.
John Driscoll, Appleton, Wis.
J. S. Dudley, Newark, Ohio.
J. R. Dunlap, Columbus, Indiana.
Simon L. Dunlap, Indianapolis, Indiana.
Dunn Bros. Lithogen Stone Co., Muncie, Indiana.
  H. E. Dunn, Muncie, Indiana.
  D. Minick, Muncie, Indiana.
H. E. Dunn, Muncie, Ind. Dunn Bros. Lithogen Stone Company.
L. P. Dunn, Terre Haute, Indiana. Pettyjohn Bros.
G. W. Dyarman, (Columbus, Ohio.)
A. R. Edmunds, Indianapolis, Ind. Standard Cement Blk and Construction Co.

H. Edmunds, Indianapolis, Ind. Standard Cement Blk. and Construction Co.
T. O. Eichelberger, Dayton, Ohio. Cottom Arti. Stone and Mfg. Co.
F. J. Eichenlaub, Erie, Pa.
W. D. Eichenlaub, Erie, Pa.
S. C. Elmore, Martinsville, Indiana.
W. E. Ellenberger, Cleveland, Ohio. Cleveland Car Company.
C. P. Englehart, Union City, Mich. Peerless Port. Cement Co.
F. H. Eno, Columbus, Ohio.
E. A. Enos, Connersville, Indiana.
Eureka Fence Post Co., Indianapolis, Ind.
    Clayton T. La Bau, Indianapolis, Indiana.
J. C. Everroad, Columbus, Indiana.
Harry Evers, Buffalo, N. Y. Buffalo Litholite Co.
E. F. Facemire, Edinburg, Indiana.
J. A. Fairleigh, Louisville, Ky. Western Cement Co.
James Farley, Homer, Ills.
D. H. Fatout, Indianapolis, Indiana.
Lyde Fay, Indianapolis, Ind. H. E. Goodwin Co.
W. B. Featherstone, Hillsdale, Mich.
W. I. Fee, Bloomington, Indiana.
Fellows & Browning, Scranton, Pa.
J. H. Fellows, Scranton, Pa. Fellows & Browning.
A. Ferguson, Indianapolis, Indiana.
Chas. Ferguson, Hillsdale, Mich.
F. Ferren, Des Moines, Iowa.
Will Fillgrove, Ironton, Ohio. Ironton Arti. Stone Co.
E. E. Fillion, Mitchell, Indiana. Lehigh Port. Cement Company.
R. R. Fish, La Grange, Indiana. Sandusky Port. Cement Co.
Geo. F. Fisher, North Tonawanda, New York.
W. H. Fisher, Mt. Gilead, Ohio.
A. Fitzgerald, Indianapolis, Ind. H. E. Goodwin & Co.
F. L. Fitzsimmons, South Bend, Ind. Ideal Concrete Machinery Co.
C. W. Flagg, Brazil, Indiana. Pettyjohn Bros.
Chas. D. Floto, Steubenville, Ohio. Concrete Construction Co.
W. G. Fluegel, Warsaw, Indiana.
Russell Fortune, Indianapolis, Ind. Municipal Engineering Co.
Wm. Fortune, Indianapolis, Ind. Municipal Engineering Co.
C. A. Foster, Elkhart, Indiana.
W. H. French, Jackson, Mich. Stringer Machine Co.
Frost & Son, Jerseyville, Ills.
    F. M. Frost, Jerseyville, Ill.
F. B. Fulton, Huntington, Indiana. Shock & Fulton.
G. T. Fulton, Hartford City, Indiana.
R. B. Fulton, Hartford City, Indiana.
M. J. Furnas, Jackson, Mich. Cement Machinery Company.
A. S. J. Gammon, Norfolk, Va. Universal Concrete Machinery Co.
Garden City Sand Company, Chicago, Ill.
    S. W. Curtiss, Chicago, Ill.
Gus Garrett, Cambridge City, Indiana.
D. L. Gaskill, Hammond, Indiana.
J. J. Gayer, Spencerville, Ohio.
Jas. Geddes, (Jackson, Mich.)
Otto Gehrlar, Milwaukee, Wis. National Bldg. Block Company.
A. F. Gelhart, Decatur, Ills.
W. H. Gemmer, Williamsport, Indiana.
Georgia Hydraulic Stone Co., Dublin, Ga.
    H. C. Quinn, Dublin, Ga.
Thos. H. Gibbons, College Corner, Ohio.
W. Mont Gibbs, Milltown, Indiana.
James D. Gibson, Youngstown, Ohio. Ohio Stone and Paving Co.

F. H. Gill, Chicago, Ills.
John P. Given, Circleville, Ohio. Cement Machinery Co.
L. M. Glass, Muncie, Indiana.
A. L. Goetzmann, Chicago, Ills. Miracle Pressed Stone Co.
J. F. Golding, Washington, D. C.
Chas. Gonghour, Canton, Ohio.
F. R. Goodrich, Traverse City, Mich.
H. E. Goodwin, Indianapolis, Ind. H. E. Goodwin & Co.
H. E. Goodwin Co., Indianapolis, Indiana.
    J. A. Ball, Indianapolis, Indiana.
    Lyde Fay, Indianapolis, Indiana.
    A. Fitzgerald, Indianapolis, Indiana.
    H. E. Goodwin, Indianapolis, Indiana.
    Wm. Goodwin, Indianapolis, Indiana.
    E. Ingles, Indianapolis, Indiana.
    J. B. Long, Indianapolis, Indiana.
    J. Overman, Indianapolis, Indiana.
Wm. Goodwin, Indianapolis, Indiana. H. E. Goodwin & Co.
Granilite Mfg. Co., Kansas City, Mo.
    B. L. Simpson, Kansas City, Mo.
Granite Concrete Stone Company, Lancaster, Pa.
    D. Frank Magee, Lancaster, Pa.
John J. Granville, Saginaw, Mich.
B. H. Graves, Lostant, Ills.
John F. Gray, Portland, Indiana.
Albert T. Gridley, Aurora, Indiana.
August Gross, New York City. Gross & Horn.
Gross & Horn, 249 Front St., New York City.
    August Gross, New York City.
    A. C. Horn, New York City.
Wm. Grove, Lebanon, Indiana.
H. A. Grover, Jackson, Mich.
J. P. Grubbs, Urbana, Ills.
H. H. Guffin, Indianapolis, Indiana.
J. W. Haas, Charlotte, N. C.
H. F. Hackedorn, Indianapolis, Ind. Block Bridge and Culvert Co.
Fred W. Hagloch, Cleveland, Ohio.
A. M. Haight, Jackson, Mich. Automatic Blk. Machine Co.
J. H. Hains, Columbus, Ohio. Winget Concrete Machine Co.
J. Harry Hale, Anderson, Indiana.
Cabell B. Hall, Louisville, Ky.
C. S. Hall, Louisville, Ky. Southern Roofing and Paving Co.
James P. Hall, Jersey City, N. J.
Chas. Hanika, Muncie, Indiana.
Karl L. Hanson, Connersville, Indiana.
J. A. Hardin, Anderson, Indiana.
J. A. Harding, Crawfordsville, Indiana.
D. N. Harper, Detroit, Mich.
Chas. Harriman, (New York City.)
Capt. L. Harris, Sergent, Neb. Miracle Pressed Stone Co.
L. R. Harshman, Sullivan, Ills.
R. Hasenwinkle, Bloomington, Ills.
H. E. Haskins, Lake Geneva, Wis.
Hayden Automatic Blk. Machine Co., Columbus, Ohio.
    J. E. Mathews, Columbus, Ohio.
    W. M. Scott, Columbus, Ohio.
J. S. Hazelrigg, Cambridge City, Indiana.
Veeder Heasley, Youngstown, Ohio.
J. P. Heckman, Creston, Ohio.
A. C. Heitschmidt, Michigan City, Indiana.

Peter Helfrich, Spencerport, New York.
E. A. Henby, Greenfield, Indiana.
J. C. Henderson, (Chicago, Ills.)
J. W. Hensley, Indianapolis, Indiana.
Edwin Hicks, North Vernon, Indiana. E. Hicks & Co.
E. Hicks & Co., North Vernon, Indiana.
    Edwin Hicks, North Vernon, Indiana.
F. G. Higgins, Indianapolis, Ind. Practical Cement Blk. Co.
W. M. Hilderbrand, South Bend, Indiana.
C. W. Hocker, Brownstown, Indiana.
A. W. Hogue, Toronto, Can. Miracle Pressed Stone Co.
F. K. Hogue, Toledo, Ohio. Waterville Cement Fence and Stone Co.
John Hohn, Indianapolis, Indiana.
Allen R. Holden, Rushville, Indiana.
Walter C. Holmes, Portland, Indiana. Holmes Brothers.
Holmes Brothers, Portland, Indiana.
    Walter C. Holmes, Portland, Indiana.
A. C. Horn, New York City. Gross & Horn.
W. W. Horn, (Memphis, Tenn.)
Fred P. Horschel, Ironton, Ohio. Ironton Artificial Stone Co.
A. J. Hostetler, Mitchell, Indiana.
E. S. Hotchkiss, Chicago, Ills. Hotchkiss Concrete Stone Co.
Hotchkiss Concrete Stone Co., Chicago, Ill.
    E. S. Hotchkiss, Chicago, Ills.
M. A. Howe, Terre Haute, Indiana.
E. W. Howell, Indianapolis, Indiana.
E. B. Hoy, Chicago, Ills. National Builder.
Richard L. Humphrey, Philadelphia, Pa.
Hunkins-Willis Lime and Cement Co., St. Louis, Mo.
    G. B. Kirwan, St. Louis, Mo.
Samuel Hursh, Galveston, Indiana.
Harry Hurst, (Louisville, Ky.)
C. C. Huston, Columbus, Ohio. Blakeslee Concrete Blk. and Machine Company.
Lora Hutto, Sharpesville, Indiana.
C. L. Huyck, Chicago, Ills.
Ideal Cement Post Co., Elkhart, Indiana.
    C. L. Catherman, Elkhart, Indiana.
Ideal Concrete Machinery Co., South Bend, Indiana.
    Fritz Arnold, South Bend, Indiana.
    F. A. Borst, South Bend, Indiana.
    F. J. Fitzsimmons, South Bend, Indiana.
    S. L. Kelly, South Bend, Indiana.
    M. Wetzstein, South Bend, Indiana.
Illinois Gravel Co., Princeton, Indiana.
    C. F. Scott, Princeton, Ills.
Illinois Steel Company, Cement Dept., Chicago, Ills.
    B. F. Affleck, Chicago, Ills.
    B. H. Bader, Chicago, Ills.
    J. C. Van Doorn, St. Louis, Mo.
    C. K. Walker, Chicago, Ills.
Indiana Cement Block and Post Co., Indianapolis, Indiana.
    W. E. James, Indianapolis, Indiana.
Indiana Fuel Company, Michigan City, Indiana.
    Geo. C. Rood, Michigan City, Indiana.
Indiana Gravel Co., Indianapolis, Indiana.
    Harold Burdge, Indianapolis, Indiana.
    J. A. Shearer, Indianapolis, Indiana.

Indianapolis Cement Products Co., Indianapolis, Indiana.
W. H. Beazel, Indianapolis, Indiana.
Fred W. Day, Indianapolis, Indiana.
Walter L. Day, Indianapolis, Indiana.
E. O. Newell, Indianapolis, Indiana.
Indianapolis Mortar & Fuel Co., Indianapolis, Ind.
A. E. Bradshaw, Indianapolis, Indiana.
E. Ingles, Indianapolis, Indiana. H. E. Goodwin & Co.
Ironton Artificial Stone Co., Ironton, Ohio.
Will Fillgrove, Ironton, Ohio.
Fred P. Horshel, Ironton, Ohio.
Fred K. Irwine, Louisville, Ky. Rock Products.
Jackson Construction Co., Cedar Rapids, Iowa.
Rolly E. Jackson, Cedar Rapids, Iowa.
Earl Q. Jackson, Greenfield, Indiana.
I. A. Jackson, Clarksburg, W. Va.
J. L. Jackson, Indianapolis, Indiana. H. H. Svmmes Co.
J. W. Jackson, Indianapolis, Ind. Practical Cement Blk. Company.
Rolly E. Jackson, Cedar Rapids, Iowa. Jackson Construction Co.
W. E. James, Indianapolis, Ind. Indiana Cement Blk. and Post Co.
John Jameson, (New York City.)
Paul A. Jandernal, New York City. Atlas Portland Cement Co.
J. B. Johannsen, Walnut, Iowa. Walnut Cement Stone Company.
Chas. L. Johnson, Sandusky, Ohio. Castalia Portland Cement Co.
J. A. Johnson, Winamac, Indiana.
P. S. Johnson, Chicago, Ills. National Builder.
H. N. Jones, Houston, Texas.
The Kakiat Company, Suffern, New York.
M. S. Daniels, New York City.
M. M. Moralee, Suffern, New York.
B. Fay Kelly, Indianapolis, Indiana.
E. B. Kelly, New York City. Contractors Supply and Equipment Co.
S. L. Kelly, South Bend, Indiana. Ideal Concrete Machinery Co.
Harry Kemble, South Bend, Indiana.
Kennedy & Berry, Detroit, Mich. David M. Kennedy, Detroit, Mich.
W. R. Kennedy, Terre Haute, Indiana.
W. F. Kerlin, Rockfield, Indiana.
Chas. Killen, Columbus Grove, Ohio.
J. M. King, Ashland, Ky.
D. H. Kirwan, Rushylvania, Ohio. Union Portland Cement Co.
G. B. Kirwan, St. Louis, Mo. Hunkins-Willis Lime and Cement Co.
A. R. Knight, Chicago, Ills. Miracle Pressed Stone Co.
Knightstown Concrete Co., Knightstown, Indiana.
Harry Watts, Knightstown, Indiana.
D. C. Kochenderfer, Paxtang, Pa. Paxtang Quarry Co.
Frank Koepfle, Cincinnati, Ohio. Koepfle Bros.
Chas. Kuhlman, E. St. Louis, Ills. Cement Machinery Co.
Clayton T. La Bau, Indianapolis, Ind. Eureka Fence Post Co.
J. W. Landrum, Terre Haute, Indiana. Terre Haute Coal and Lime Co.
Wm. C. Lantry, Milwaukee, Wis. Western Lime and Cement Co.
E. S. Larned, Boston, Mass.
Chas. Lawrence, (Indianapolis, Indiana.)
J. W. Laymen, (Indianapolis, Indiana.)
Fred J. Lee, Saginaw, Mich. U. S. Cement Shingle and Machinery Co.
John N. Le Hew, Warsaw, Ind. Thos. M. Le Hew & Son.
Lehigh Portland Cement Company, Allentown, Pa.
E. E. Fillion, Mitchell, Indiana.
Wm. L. Whitaker, Mitchell, Indiana.
John Levandouski, LaFayette, Ind. Cement Machinery Mfg. Co.
Peter Levandouski, LaFayette, Ind. Cement Machinery Mfg. Co.
Paul H. Lieske, Indianapolis, Indiana.

Wm. O. Line, Liberty, Indiana.
J. F. Lockley, Grand Rapids, Mich. Newaygo Portland Cement Co.
J. B. Long, Indianapolis, Indiana. H. E. Goodwin & Co.
A. C. Loomis, Mattoon, Ills.
E. J. Lord, Honolulu, H. I.
Daniel B. Luten, Indianapolis, Indiana.
G. B. Lynch, Darlington, Indiana.
E. E. Lyst, Anderson, Indiana.
E. C. Mack, Alton, Ills.
A. D. Mackay, Chicago, Ills. A. D. Mackay & Co.
A. D. Mackay & Co., Chicago, Ills.
D. Frank Magee, Lancaster, Pa. Granite Concrete Stone Company.
S. J. Mandeville, Martinsville, Indiana.
Alfred Mankedick, Sullivan, Indiana. Sullivan Cement Works.
Chas. Mankedick, Sullivan, Ind. Sullivan Cement Works.
H. A. Mansfield, Indianapolis, Indiana.
F. A. Marine, Mooresville, Indiana.
Marquette Portland Cement Co., Chicago, Ills.
  Wm. Dickinson, Chicago, Ills.
C. E. Martin, Piqua, Ohio.
D. L. Mather, Richmond, Indiana.
J. E. Mathews, Columbus, Ohio. Hayden Automatic Blk. Machine Co.
Chas. Mayer, Cincinnati, Ohio.
Geo. F. Mayer, Indianapolis, Indiana.
D. A. McBride, (Chicago, Ills.)
L. D. McClaflin, Jackson, Mich. Cement Machinery Co.
J. H. McCreary, Galion, Ohio.
Ernest McCullough, C. E., Chicago, Ills. Municipal Engineering and Contracting Co.
Gabriel McDonald, St. Louis, Mo. St. Louis Crushed Quartz Co.
E. B. McDowell, Columbus, Ohio. Winget Concrete Machine Co.
John A. McDowell, Columbus, Ohio. Winget Concrete Machine Co.
Harry McKay, Indianapolis, Indiana.
Chas. F. McKenna, New York City.
W. O. McKinney, Piper City, Ills.
H. A. McKinnon, Ashtabula, Ohio.
John McNamara, Newark, Ohio.
J. A. McNiern, Canton, Ohio.
C. D. Meeker, Monticello, Indiana. Monticello Lumber and Coal Co.
A. J. Meidroth, Peoria, Ills.
C. M. Menefee, Ft. Wayne, Indiana.
O. F. Menefee, Ft. Wayne, Indiana.
J. F. Messick, Indianapolis, Ind. Ind. H. S. Palmer Co.
Arthur D. Metcalf, Princeton, Indiana.
Alfred Meurer, Janesville, Wis.
H. R. Miles, Upland, Indiana.
P. B. Miles, Jackson, Mich. P. B. Miles Mfg. Co.
P. B. Miles Mfg. Co., Jackson, Mich
  W. A. Bruce, Indianapolis, Indiana.
  P. B. Miles, Jackson, Mich.
  A. J. Ralph, Indianapolis, Indiana.
  J. H. Wiest, Indianapolis, Indiana.
John Miller, C. E., Sandusky, Ohio.
Milwaukee Concrete and Supply Co., Milwaukee, Wis.
  S. D. Austin, Milwaukee, Wis.
C. W. Minick, Knightstown, Indiana.
D. Minick, Muncie, Ind. Dunn Bros. Lithogen Stone Co.
O. U. Miracle, Minneapolis, Minn. Miracle Pressed Stone Co.
R. O. Miracle, Minneapolis, Minn. Miracle Pressed Stone Co.

- Miracle Pressed Stone Co., Minneapolis, Minn.
  - A. F. Bowers, Chicago, Ills.
  - A. L. Goetzmann, Chicago, Ills.
  - Capt. L. Harris, Sergent, Neb.
  - A. W. Hogue, Chicago, Ills.
  - A. R. Knight, Chicago, Ills.
  - O. U. Miracle, Minneapolis, Minn.
  - R. O. Miracle, Minneapolis, Minn.
  - J. W. Pierson, New York City.
  - A. N. Pierson, New York City.
  - J. O. Parry, Chicago, Ills.
  - E. B. Swift, Indianapolis, Indiana.
- J. A. Mitchell, Goshen, Indiana.
- C. A. Monks, Louisville, Ky. Southern Roofing and Paving Co.
- A. Monsted, Milwaukee, Wis.
- Monticello Lumber and Coal Co., Monticello, Indiana.
  - C. D. Meeker, Monticello, Indiana.
- Harry L. Mooar, Columbus, Ohio.
- Perry Moore, Bloomingdale, Indiana.
- The Moore-Mansfield Construction Co., Indianapolis, Indiana.
  - DeWitt V. Moore, Indianapolis.
- Chas. Moorman, Rushville, Indiana.
- E. B. Moorman, Rushville, Indiana.
- M. M. Moralee, Suffern, New York. The Kakiat Company.
- M. H. Muelhauser, Cleveland, Ohio.
  - Standard Sand and Machine Co., Cleveland, Ohio.
- Municipal Engineering and Contracting Co., Chicago, Ills.
  - C. H. Bathrick, Chicago, Ills.
  - Ernest McCullough, C. E., Chicago, Ills.
- Municipal Engineering Co., Indianapolis, Indiana.
  - Chas. C. Brown, Indianapolis, Indiana.
  - Russell Fortune, Indianapolis, Indiana.
  - Wm. Fortune, Indianapolis, Indiana.
  - S. W. Peet, Indianapolis, Indiana.
  - F. T. Randall, Indianapolis, Indiana.
- Municipal Journal and Engineer, New York City.
  - J. M. Schloenback, Chicago, Ills.
- Samuel Munnel, Cannonsburg, Pa.
- W. M. Munson, Jr., Mitchell, Indiana.
- R. O. Myers, South Bend, Indiana.
- W. B. Myers, Chicago, Ills.
- National Bridge Company, Indianapolis, Indiana.
  - J. T. Richards, Indianapolis, Indiana.
- National Builder, Chicago, Ills.
  - E. B. Hoy, Chicago, Ills.
  - P. S. Johnson, Chicago, Ills.
  - A. E. Taylor, Chicago, Ills.
- National Building Block Co., Milwaukee, Wis.
  - H. F. Behrle, Milwaukee, Wis.
  - Otto Gehrlar, Milwaukee, Wis.
  - J. P. Sherer, Milwaukee, Wis.
- Newaygo Portland Cement Co., Grand Rapids, Mich.
  - R. S. Conner, Grand Rapids, Mich.
  - J. F. Lockley, Grand Rapids, Mich.
- New Enterprise Machinery Co., Chicago, Ills.
  - D. D. Riddle, Chicago, Ills.
- E. O. Newell, Indianapolis, Ind. Indianapolis Cement Products Co.
- New Jersey Cement Stone Co., East Orange, N. J.
  - Robert Neagel, Greensburg, Indiana.
  - J. W. Pearson, East Orange, N. J.

W. H. Nince, Barberton, Ohio.
J. D. Noble, Indianapolis, Indiana.
L. P. Normandin, Jackson, Mich. Cement Machinery Co.
H. F. Northup, Gilford, Indiana.
Northwestern Expanded Metal Co., Chicago, Ills.
    Gen. H. A. Wheeler, Chicago, Ills.
D. W. Norton & Co., Vincennes, Indiana.
Chas. F. O'Donnell, Bellefontaine, Ohio. Buckeye Port. Cement Co.
T. J. O'Hara, Alexandria, Indiana.
Ohio Stone and Paving Co., Youngstown, Ohio.
    L. D. Gibson, Youngstown, Ohio.
Chas. Ohmart, Dayton, Ohio.
Oil City Sand Co., Oil City, Pa.
    G. F. Roess, Oil City, Pa.
J. R. O'Neil, Indianapolis, Ind. American Bldg. Blk. Co.
E. Osgood, (Chicago, Ills.)
J. M. Osmun, (Champaign, Ills.)
J. Overman, Indianapolis, Ind. H. E. Goodwin & Co.
E. H. Oversmith, Jackson, Mich.
Albert W. Palmer, Brooklyn, N. Y. Noyes F. Palmer Mfg. Co.
E. D. Palmer, Yankton, S. D.
H. S. Palmer, Washington, D. C. H. S. Palmer Co.
H. S. Palmer Co., Washington, D. C.
    W. W. Benson, Washington, D. C.
    H. S. Palmer, Washington, D. C.
Noyes F. Palmer, Brooklyn, New York. Noyes F. Palmer Mfg. Co.
Noyes F. Palmer, Mfg. Co., Brooklyn, New York.
    Albert W. Palmer, Brooklyn, N. Y.
    Noyes F. Palmer, Brooklyn, N. Y.
J. O. Parry, Chicago, Ills. Miracle Pressed Stone Co.
E. A. Parsons, Chicago, Ills.
J. A. Patterson, Gassaway, W. Va.
F. E. Paulson, Cleveland, Ohio.
Paxtang Quarry Company, Paxtang, Pa.
    D. C. Kochenderfer, Paxtang, Pa.
J. W. Pearson, East Orange, N. J. N. J. Cement Stone Co.
J. M. Pease, Geneva, Indiana.
Peerless Portland Cement Co., Union City, Mich.
    C. P. Englehart, Union City, Mich.
S. W. Peet, Indianapolis, Ind. Municipal Engineering Company.
S. V. Peppel, Louisville, Ky.
L. F. Perdue, Terre Haute, Indiana.
C. F. Perkins, Danville, Ills.
Dan E. Petro, Cambridge City, Indiana.
Pettyjohn Bros., Terre Haute, Indiana.
    J. M. Cutshall, Brazil, Indiana.
    L. P. Dunn, Terre Haute, Ind.
    C. W. Flagg, Brazil, Indiana.
    L. Pettyjohn, Terre Haute, Indiana.
L. Pettyjohn, Terre Haute, Ind. Pettyjohn Bros.
P. H. Phillips, Burlington, Iowa. Cement Machinery Mfg. Co.
Wm. Phillips, Columbus, Ohio. Cement Machinery Co.
Pickaway Cement Blk. Co., Circleville, Ohio.
    Geo. T. Row, Circleville, Ohio.
C. Pickett, Marshall, Indiana.
H. H. Pierce, Chicago, Ills.
John C. Pierce, Rockville, Indiana.
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Associated Expanded Metal Companies, New York City. Expanded metal forms and sidewalk slab.

Atlas Portland Cement Co., New York City. Cement, material of which it is manufactured, and products.

Automatic Building Block Machine Co., Jackson, Mich. Hollow concrete block machine.

Blakeslee Concrete Block and Machine Co., Columbus, O. The Blakeslee hollow concrete block machine.

Brady Cement Stone Machine Co., Jackson, Mich. The Brady hollow concrete block machine.

Castalia Portland Cement Company, Pittsburg, Pa. Travertine, clay and cement.

J. H. Catherman & Son, Elkhart, Ind. Model of the Ideal cement post.

Century Cement Machine Co., Rochester, N. Y. Hollow concrete block machine.

Chase Foundry and Mfg. Co., Columbus, O. Transferring and drying truck.

Cleveland Car Co., West Park, O. Cars for transporting blocks.

Concrete Publishing Co., Detroit, Mich. "Concrete," magazine.

J W. Cooper, Minneapolis, Minn. Hollow concrete block machine.

Cottom Artificial Stone and Mfg. Co., Dayton, O. Cottom hollow concrete block machine.

E. H. Defebaugh, Louisville, Ky. "Rock Products" magazine.

Dever Cement Tank and Silo Co., Cassopolis, Mich. Concrete tank model.

Simon L. Dunlap, Indianapolis, Ind. Mold for building cement cisterns.

H. E. Goodwin, Indianapolis, Ind. The Goodwin hollow block machine.

Gross & Horn, New York City. Dehydratine.

Hayden Automatic Block Machine Co., Columbus, O. Hayden hollow concrete block machine.

Huntington-Miller Co., Jackson, Mich. Concrete block machine.

Indianapolis Cement Products Co., Indianapolis, Ind. The Miracle hollow concrete blocks and machinery.

International Fence and Fireproofing Company, Columbus, O. Reinforcing for concrete and fireproofing system and concrete mixer model.

O. M. Jumper, Wheatfield, Ind. Cement sidewalk tools.

Municipal Engineering Co., Indianapolis, Ind. "Municipal Engineering," magazine. "Directory of American Cement Users" and "Handbook for Cement Users."

Municipal Engineering and Contracting Co., Chicago, Ill. Concrete mixers.

Harmon S. Palmer Concrete Building Block Machine Co., Washington, D. C. The H. S. Palmer hollow concrete block machine.

Noyes F. Palmer Mfg. Co., Brooklyn, N. Y. The N. F. Palmer hollow concrete block machine.

Pettyjohn Bros., Terre Haute, Ind. The Pettyjohn concrete block machine.

Porter, Taylor & Co., Chicago, Ill. "The National Builder," magazine.

Ralph & Wiest, Indianapolis, Ind. The Miles concrete block machine and the Seamans brick machine.

Ricketson Mineral Paint Works, Milwaukee, Wis. Mortar colors.

Roman Stone Co., Chas. S. Watson, Mgr., Toronto, Ont. Photographs of buildings, etc., of cast stone.

E. W. Seamans, Grand Rapids, Mich. The Seamans block and brick machines and indurating process.

Standard Sand and Machine Co., Cleveland, O. Simplicity hollow concrete block machine and concrete mixer.

St. Louis Crushed Quartz Co., St. Louis, Mo. Broken stone for special concrete work.

St. Louis Portland Cement Co., St. Louis, Mo. Portland cement literature.

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The Contractors' Supply and Equipment Co., Chicago, Ill. The Smith concrete mixer.

The National Building Block Co., Milwaukee, Wis. The products of the National two-piece block machine.

Universal Concrete Machinery Co., Norfolk, Va. Model of hollow concrete block machine.

U. S. Cement Shingle Machinery Co., Saginaw, Mich. Zwerk's cement shingles on a roof and the machine for making them.

Western Cement Co., Louisville, Ky. Bricks of Louisville cement, sand and a chemical.

Whitehall Portland Cement Co., S. J. Vail, Chicago, Ill. Portland cement literature.

Winget Concrete Machine Co., Columbus, O. The Winget hollow concrete block machine.

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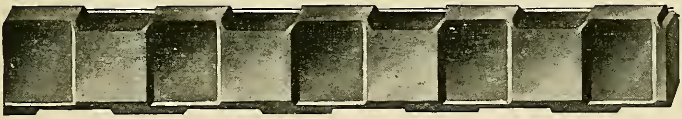

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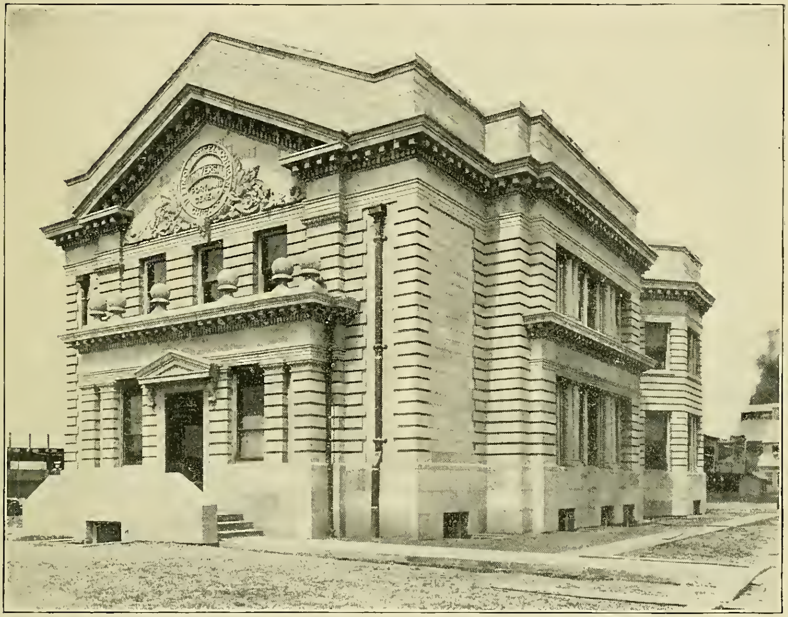

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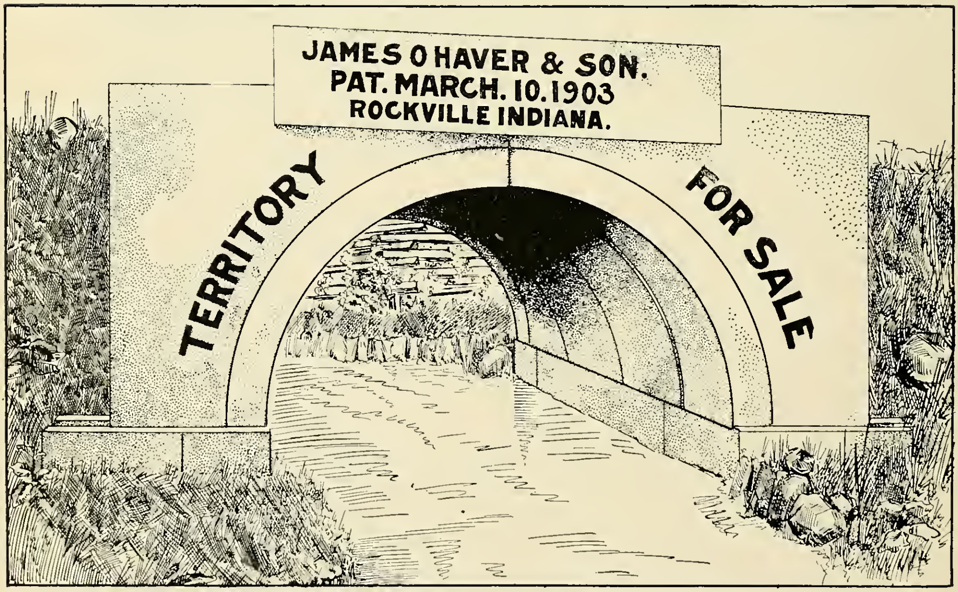

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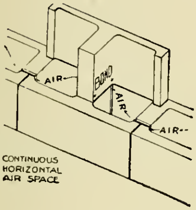

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That tamped blocks make wet walls,
That such walls are not stone but cemented sand,
That damp sand and cement will not make true concrete,
That tamping damp sand displaces that already tamped adjoining,
That this produces a block lacking in density,
That you cannot safely plaster on such a wall without expense of furring,
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That you have a wall with only thirty per cent of air space,
That you have no continuous horizontal air space,
That you have a wall with no cross bond,
That you have a system requiring two men to handle a block and a derrick to put it in the wall,
That you have a system slow and laborious in manufacture and laying,
That you have no way of facing your work:

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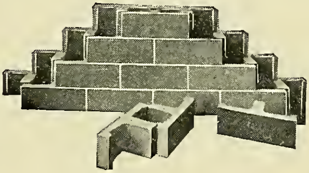

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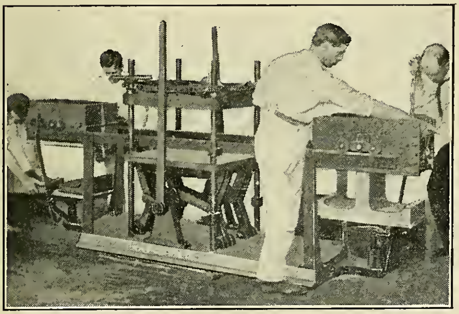

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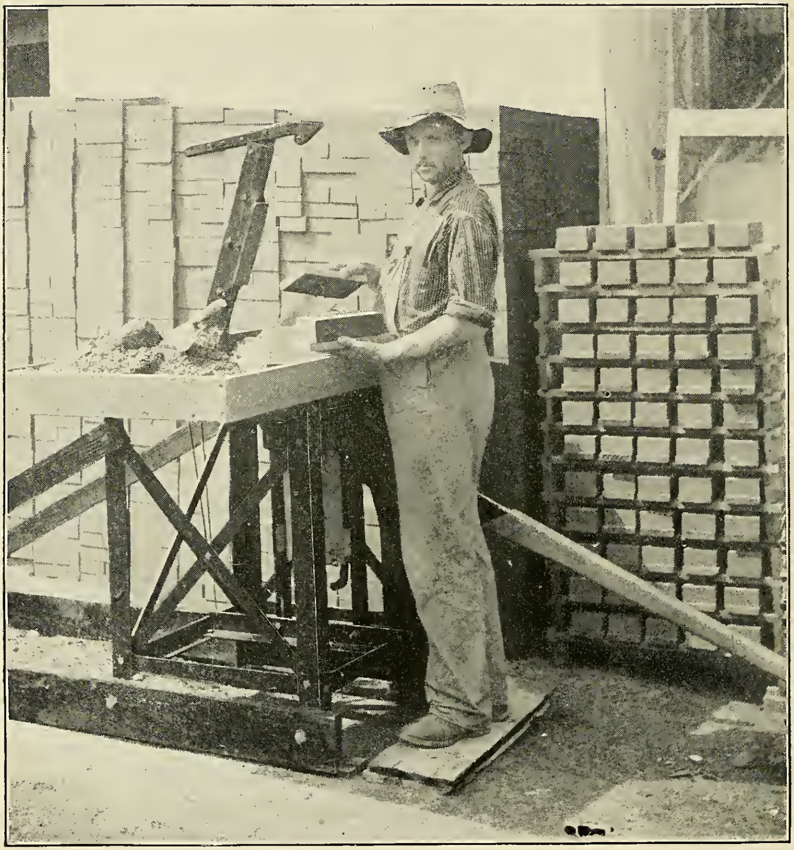

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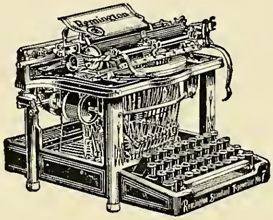

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